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Phosphorus, &c.—M. A. Wier, 5026.

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Registering, &c.—W. R. Lake (com.), 4794. H. J. Fieldus, 4864, E. T. Darke, 4888. W. R. Bacon, 4933. J. Möller, 4962. F. S. Brown and J. Burrell, 4993. J. H. Storey and J. W. Kenyon, 4996. O. Eiscle, 5036. A. Kennard, 5071. B. Towers, 5205.

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Salt, Brine, &c.—L. Brun and O. Rose 5091.

Scents, Scent Bottles, &c.—A. Sauvée, 4776. G. W. Betjemann, 5059.

Screens.—A. M. Clark, 4823.

Screws, Screw Drivers, &c.—S. Chatwin, 4964. T. A. Weston, 5190.

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Shears, &c.—H. S. Purkis and W. G. Etchells, 5046.

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Slabs, &c.—W. H. Russell and W. C. Straker, 4753. L. A. Brode, 5170.

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Upholstery.—E. G. Brewer (com), 4792. C. S. P. Wood, 4853. B. Sawtell, 4992. W. Brierley (com.), 5180. G. O'Brien, 5182.

Urinals.—F. Wirth (com.), 4908.

Valves, Taps, Stop Cocks, Plugs; Regulating the Flow and Pressure of Fluids.—J. G. Wilson (com), 4748. W. White, 4956. S. Sampson, 4968. H. W. Pendred, 4975. J. D. Churchill, 4977. A. M. Clark (com.), 5025. F. Nunns, 5060. W. and R. Robinson, 5096. H. J. Allison (com.), 5171. H. N. Maynard, 5195. A. C. Mather, 5212.

Velocipedes, Bicycles, &c.—H. J. Brookes, 4840. T. Bayliss, J. Thomas, and J. Slaughter, 4842. H. T. Kerby, 5043. H. E. Cox, 5112. T. and J. H. Palmer, 5145. A. Wilson, 5159.

Ventitation: Supplying and Purifying Air for Buildings, Mines, Ships, Carriages, &c.—T. D. Clare, 4847. A. Bell, 4859. R. H. Griffin, 4913. T. B. and T. R. Jordan, 4952. G. O'Brien, 5182. T. J. Boulker and M. Watson, 5218.

Walking Sticks.—G. H. R. Dabbs, 5194.

Washing, Cleansing, and Wringing Fabrics, Yarns, and Materials.—A. W. Kirk and J. Leeming, 4815. J. Paterson, 4819. A. Pollock, 5000.

Waterproofing, &c.—W. P. Thompson (com.), 4867. A. M. Job, 4875. W. J. Almond, 5073. F. G. de Buda (com.), 5316.

Wearing Apparel, &c.—G. W. von Nawrocki (com.), 4779. G. W. von Nawrocki (com.), 4899. H. J. Haddan (com.), 4929.

Weaving, Braiding, Plaiting, Preparing for Weaving.—W. Campion, 4736. T. Coltman and J. A. Freiichs, 4757. A. R. Austin, 4782. E. Taylor, 4983, G. Ambler, 5008. G. Rydill, 5001. C. and T. H. Brigg, 5034. W. Cockcroft and J. Hudson, 5072. T. Sands, 5082. R. C. Stephenson, 5115.

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Wheels for Carriages, &c.—J. Willis, 4838. H. J. Brookes, 4840. T. E. Rigby (com.), 4871.

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Winding Threads, &c.—S. Bash and H. Levy, 4751. J. Bottomley, 5200.

Windows and Sashes.—H. J. Fieldus, 4816. J. Pilbrow, 4954. C. E. Gibson, 5028. T. Hyatt, 5050. R. J. Worrall, 5222.

Wire, Wire Working, &c.—P. M. Justice (com.), 4801. J. C. Mewburn (com.), 4916. W. Wilmsmann, 4963. J. Imray (com.), 5004. J. Imray (com.), 5044.

Wood and Veneer.—R. Ramsden, 4812.

Wrenches, Spanners, &c.—B. L. Atwood, 5123.

Yeast.—H. V. Haig, 5106.

Zinc.—J. B. Freeman, 5121.

⁂ *The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.*

Reviews.

HIBBERD ON CHEAP WATER SUPPLY.

"Water for Nothing: Every House its own Water Supply." By Shirley Hibberd. Effingham Wilson, Royal Exchange.

The appearance of a shilling pamphlet on water supply is an event we must at a time like the present, when so many of our cisterns have been getting no inflow from the water companies' storage, be a matter of deep interest. Mr. Hibberd directs attention in this brief essay to a source of supply that has been neglected by all parties alike, by the companies, as a matter of course, and by the scientists and philanthropists, as if by mutual agreement. We are assured by the author that the source he refers to is neglected through sheer ignorance of its value, and of the best modes of turning it to account. He quickly comes to the point as to the water that may be obtained for nothing:—

"Whatever may be the course of legislation on this subject," he remarks, "or the policy of the companies to avert legislation and keep affairs safely in their hands, it is certain every man has at his command, to a very great extent, the means of securing an abundant and perfect supply of water by the simple process of utilising the rainfall. In this year of agitation on the subject the rainfall has been more copious than has been known for many years, and has been almost wholly allowed to run to waste. There has been 'water, water, everywhere, but not a drop to drink.' Nor is the wanton waste in rainfall the only sin society has to answer for in the presence of a bountiful Providence. The cost of its removal by means of channels and drains is enormous, and the addition of the rainfall to sewage proper renders the utilisation of sewage impossible by reason of its unmanageable bulk and excessive dilution. Thus the rain that we refuse to catch and keep adds to the burden of the ratepayer by every drop that falls, and is made the means of conveying to the sea, to be lost for evermore, those constituents of the soil that are the causes of fertility. We are prospecting among the hills and boring into the depths of the earth in search of water, while if we would but look to heaven we should have plenty, and the Divine assurances of heavenly drink for evermore. The rainfall in London averages twenty-five inches. One inch of rain falling on an acre of ground is 22,622 gallons, and, if there are twenty-five houses on that acre of land, the total annual rainfall is exactly that amount for each of them. Suppose only one-tenth of the total fall is caught and saved for household purposes, that is 2,262 gallons per house. The rainfall of the present year will greatly exceed the average, but exceptional circumstances should not be brought into the present consideration."

It happens that the few who in towns are familiar with rain water as stored for domestic use have no great liking for it as a beverage, and the taste runs invariably in favour of spring water. But the author assures us this is a prejudice founded on misapprehension of facts and mismanagement of rain water. He says:—

"The proposal to use rain water for any but the roughest purposes will surprise a few, and annoy many. Rain water is in bad repute, more especially in towns. Here and there we meet with an ill-looking water-butt, from which may be drawn a sooty fluid that is less remarkable for its sootiness than for its offensive odour, and sometimes for the plenitude of mysterious life it contains in the shape of wriggling and jerking creatures, whose activities indicate that the water must contain something substantial for their sustenance. It might be better to be content with the water supplied by the companies than to drink such filth as this, but the filthiness is profoundly instructive. The companies travel far and incur great expenditure to discover springs and wells; they construct great engines and filtering beds, and in various ways make a business of obtaining and preparing water for domestic use. But when the householder enters into the business for himself he sticks up a second-hand rum puncheon, without a cover, in the full sun, exposed to all weathers as a contemptible thing, and in due time complains that it stinks! Well, a leg of mutton would do the same thing. If water is worth having it is worth respectful and reasonable treatment, and when rain water obtains this treatment it is better in appearance, better in flavour, better for cooking, washing, and all other domestic uses, than any other water, no matter from what source obtained. This subtle element acquires contamination of some sort the instant it touches the earth; and the contamination is in exact proportion to the nature and solubility of the earth that constitutes the watershed, the watercourse, the bed of the lake, and the reservoir. Hence, indeed, the endless diversities in the characters of waters, for wherever we travel we meet with water characteristic of the place—often too characteristic; so that it becomes a serious question, how best to do with it, or live without it. The immense use of aerated waters and 'mineral' waters generally affords, testimony to the unsatisfactory nature of the prevailing supplies. But it is a grave question whether these conduce to the health of those who consume them. This, however, is beyond dispute, that many forms of disease, not the least of the number being urinary calculus and goitre, are direct results of the habitual use of waters impregnated with mineral substances that are never properly eliminated from the frame. The danger of mineralisation is made manifest in the constant endeavours of all concerned to obtain *pure* water, and the scrupulousness with which the percentage of organic and mineral matters in any particular water are noted and commented on. And when the purest water obtainable is obtained, it is but rain water with the least cantamination possible. What else is the water of Loch Katrine? The reason of its purity is that it is fed from a rock which yields but infinitesimally of its mineral constituents to the solvent powers of water."

The interest therefore turns upon the question, how should rain water be caught and kept? We learn that darkness is one of the necessary conditions for the preservation of small quantities of water, and that therefore water tanks should be always closed in. But the matter of chief importance occurs at the commencement of the business. When rain begins to fall upon a roof it gathers various kinds of impurities, which are carried by the stream into the tank or water butt. Mr. Hibberd points out that when the roof is well washed the further supply, if rain continues, is comparatively pure, and soon acquires by mere subsidence or filtering a beautiful brightness and a pleasant flavour, being then equal in purity to distilled water. It follows, therefore, that the first flow of water from a roof, whether in country or town, should be set apart for rough purposes, such as watering the garden and washing down the yard. And this, it is shown, can be accomplished without trouble, for by suitable arrangements of a purely mechanical nature the bad water may be made to flow in one direction, and the good water in another. This is a matter of the utmost importance, for hitherto the sootiness of rain water has been its condemnation. Amongst the plans proposed, one comprises an arrangement of tanks by means of which the first supply is stored in a waste receptacle, and this being filled with the washings of the roof, the water passes directly to the proper storage tank, which may be fitted with a filter, so that every drop drawn within the house will be refined to the last degree. This affair is entirely self-acting, and needs but to be properly started to continue in action for several generations. Another plan consists in the adoption of a percolator, which may be roughly described as a double funnel. This is attached to the common stack pipe, and all that is needed in the way of extra apparatus is a separate pipe for the pure water, and a tub or tank to receive it. When rain commences the percolator admits the water through the smallest of the two funnels, and passes it out to the waste as worthless, or at all events unfit for household purposes. But when the roof is well washed, the percolator by mechanical action turns on a swivel, and then the water passes through the large funnel to the supplementary pipe, and thus finds its way to the proper household storage. This apparatus, like the arrangement of tanks, needs no special attention, and consequently rain falling at night is sorted and saved with the same precision as in the daytime, all the watching required being to see that such things as dead leaves and sparrows' nests are not allowed to accumulate in or upon the apparatus to impede its working.

The supply of villages and of small houses built in blocks in towns obtains attention. Mr. Hibberd proposes the formation of artificial watersheds on the cheapest land obtainable near small towns and villages, and the collection of the rain water by methods which effectually exclude the access of animals that might pollute the water. Examples of the utilisation of local rainfall are given, and a series of tables to aid in determining the proper sizes and capacities of pipes, tanks, filters, &c., &c. Mr. Hibberd concludes this interesting little work with the following statements:—

A correspondent, writing on this subject, says: I and my family, six in all, for three years dwelt in a suburb south-east of London, and obtained all the water we needed without any help from a company, and consequently we never paid a farthing for the supply. We had enough and to spare, and our neighbours were often accommodated out of our abundance. All the rain water that fell on the roofs of the house and outbuildings was conveyed to a cistern sunk in the garden. This was nine feet deep and four feet in diameter, bricked and cemented at sides and bottom, and covered with a trap door at top. The water was used in its natural state for household and garden purposes, but for drinking it was passed through a charcoal filter. I could not wish for better water; sweet, soft, and silky; perfection for tea making and washing, and comforting to the mind, because known to be free from taint of sewage and insidious mineral impurities."

The Abyssinian Tube Well has obtained but little attention in this country, although it is a most valuable auxiliary to the rain-water tank or the company's supply. Its simplicity and effectiveness are remarkable. A perforated tube is driven a certain depth —usually a few feet only—into the soil, and a pump is attached, and presently there is a fair supply of water. As might be expected, it is of little use on chalk and sand, because in such soils there is not usually any water near enough to the surface to be caught by such a frail trap. But, wherever there is water within a few feet of the surface, as there is in most heavy soils, and even in sheer sand and gravel occasionally, the tube well will secure it, and the supply may be regarded as inexhaustible. It is of necessity hard water, and more or less bad or indifferent, as may be determined by the circumstances of its origin. Within a certain range of conditions any kind of water is valuable, and the tube well has its place in these economies.

All filters, of whatever kind or shape, should be periodically examined and cleansed. The impurities they remove from the water may accumulate in them or upon them, to the detriment of their action and the injury, in various ways, of the household. It is too much the rule to leave filters to take care of themselves, which they are no more able to do than are the thirsty citizens they endeavour to serve faithfully.

If water supply may be called a "burning question," so also may the same be said of our means for preventing and extinguishing fire. Practically we have no means for either except in great towns. The country house, isolated in the midst of its own grounds, is likely to become a heap of mere charcoal and broken glass and twisted ironwork within an hour of the breaking out of fire in any part of it. But a fire dealt with promptly and with suitable appliances may usually be extinguished with ease and rapidity. A good supply of water on the spot is certainly one of the necessary safeguards, and a light garden engine on wheels is another. When a fire occurs people rush about and waste their strength in cries of alarm, because they are suddenly convinced of their utter helplessness. But in a well-ordered house the case is different, and when a fire happens each one knows what to do. The barrel engine, with its fittings all in perfect order, and the syringes and other such things, should be housed beside the water tanks, and in an emergency every one will know where to find them. A finely-divided spray, consuming a comparatively small amount of water directed upon the place of the burning, will produce an effect instanter, while perhaps a heavy stream, or water thrown from buckets, would produce no effect at all. If the value of pure water for every day use does not appear a sufficient argument for the storage of rain water, the need of water for the extinction of fire may be urged, for, as the case stands, there is never anywhere a sufficient body of water to render suitable engines and willing hands promptly effectual in extinguishing fire. Hence it is that fires usually continue until there is nothing left to burn, and the best that can be done is to prevent them from extending beyond the site of their origin, whether it be a house, a corn rick, or a stack of timber. *Bonum magis carendo quam fruendo cernitur.*

WASHING AT HOME.

"How we Wash at Home." By Mrs. H. Sheldon-Williams. London: Harper Twelvetrees, 40, Finsbury Circus.

This is a small work descriptive of the advantages of Harper Twelvetrees' washing, wringing, and mangling machines, as to which Mrs. Williams says:—

First let the reader clear from her mind all the old traditions of washing, created, I do believe, purposely to spread a mist of difficulty round the simple process, by those who wished to keep it in their own hands. All of those notions have fallen from me one by one, as experience has taught me better, and I only wish before beginning my instructions I could show the snow-white sheets, table-cloths, and other things at this moment airing in my kitchen before being put away. There were fifteen dozen different articles in the wash, beside the flannels, socks, stockings, and kitchen cloths, dusters, &c. For that quantity of clothes we used four pieces of soap. I cut the bars into seven squares, so four squares are not quite 2lb. No soda or washing powder of any kind is used; one knob of blue. Enough firing, a little wood and coke, to make the copper boil up once, the money for the woman who comes to help, and you have the whole expense of the week's washing. I hardly know what to allow for a woman's keep, as it varies so much, and my present washerwoman is a very small eater.

The old-fashioned plan is to soap in in warm water. Banish it from your mind at once. I know every laundress will tell you cold water is of no use. Try it, and you will never go to the worse than useless trouble of soaping in. The effect of a hard piece of soap rubbed on stains, &c., is only to rub them in. Everyone knows that cold water will take out ink, then why not simple dirt?

The copper is filled over night, of course, that everything may be ready next morning. But we have only the copper to provide enough boiling water, nothing is ever boiled. Boiling destroys every fabric, and as all washerwomen agree that if a thing does not go clean into the copper it never comes out clean, I would ask, where is the necessity or use of boiling? In illness, of course, boiling is necessary to destroy the germs of infection in the clothes. The four squares of soap are cut into thin slices, into a gallon pan—a common red pan or zinc bowl will do; boiling water, boiling as if you were going to make tea, must be poured from the kettle on the soap till the pan is nearly full, stir for four or five minutes, when all will be dissolved. This will be found next morning in a firm blancmange-like mass. I allow no hard soap to be used from first to last in the washing. Then we go to bed happy. The clothes are soaking, the soap is melting, the washing will be partly doing itself all night.

Next morning, one by one every article is wound out through the rollers, and when everything had been wrung out, the colour of the water would convince the most sceptical that clear cold water is the best extractor of dirt. The clothes are not moved or stirred in the water. Merely laid in over night, and wrung out in the morning. We set aside in one basket by themselves handkerchiefs, collars, cuffs, and more especially brown holland pinafores—the last for a reason which will appear presently. When the machine is empty, the contents of one pan after another of soaking clothes are turned into it, and passed through the rollers, till all have been wrung out. The machine is then emptied and carefully wiped out. The water runs away through a hole near the bottom, which has a small plug in it.

By this time the water in the copper is or ought to be boiling. Here I would say a word as to the heating of the copper. Do not let any coal be used. Servants if allowed, will put in large lumps of coal. This is a great and useless extravagance, as coal gives much less heat than coke or cinders; therefore when it is used the water takes longer to boil; besides, the soot from coal chokes up the copper flue. When boiling (and this is most important, as the water must be actually boiling), fill the machine with it to within a hand's length of the top, put in half your soap jelly, and drop into this boiling lather some of the things you set aside. The holland pinafores should always go in with the first, as the very hot soapy water improves them. Be careful not to put in too many clothes at a time, or the dolly cannot work freely; the clothes might be torn, and the soapy water cannot rush through them. The swing handle should now be worked backwards and forwards for a few minutes, and the dolly removed; then with a long wooden spoon carefully lift up one thing at a time to the rollers and wring out. The water must be all the time much too hot to allow of the hands being put in, so we use a wooden spoon, as it does not poke holes like a stick. When the hollands, handkerchiefs, &c., are wrung out, proceed in the same way with the rest of the clothes. Nothing should be rubbed except the inside of collars or knees of children's drawers, and for them a little of the soap jelly is rubbed on as they are lifted out of the machine, and then they are put back again into the suds. This we find quite sufficient. When through half the clothes, a few pailfuls of water are taken out and replaced by boiling water, and the remaining soap is added. As the clothes are never really dirty, for the reason that they can be changed often with no expense, we find this second addition finishes the washing.

The suds must be changed when necessary. The rollers wring everything so dry out of the soaking-water that very little dirt remains behind for the suds, which consequently can be used much longer than in hand washing. We are particular to have the water boiling, or as near it as possible. This, of course, does not apply to woollen things, which must have very strong lather, but only lukewarm. I always have them carried straight from the machine to the line, as then they look better, and also dry in time to leave all the lines free for the linen. For blankets, knitted things, and socks the machine is invaluable, it brings up the nap, and everything looks new again.

Every one wishing to practise true domestic economy should peruse this penny pamphlet.

“Tablet Almanac.” “Hand and Heart” Publishing office, 1, Palmerston-buildings, Paternoster-square.

THIS is a religious almanac, having Scripture sentences placed against each day. It has good illustrations, comprising a portrait of the late Frances Ridley Havergal, with autograph; twelve calendar illustrations for months; “The Voice of Harvest;” “The Old Fishing Boat,” &c. It is a well-designed and executed little work; but, being of the class of works which the SCIENTIFIC REVIEW does not profess to have dealings with, we can say no more.

ROBIN DINNERS.

“Robin's Carol, and What Came of It: the Story of the Robin Dinners.” Edited by the Rev. CHARLES BULLOCK, Editor of “Hand and Heart,” author of “England's Royal Home,” &c. With Original Illustrations by S. C. PENNEFATHER and others. Third thousand. London: “Hand and Heart” Publishing office, 1, Paternoster-buildings, E.C.

THIS is a Christmas book of attractive appearance, its *raison d'être* being to promote a philanthropic scheme of giving occasional dinners to those poor children who very seldom get any. The scheme is worthy of support, and the book is worth reading.

SERIALS.

Messrs. Cassell's various serials, such as “Cassell's Natural History,” edited by Prof. Martin Duncan, F.R.S.; “Science for All;” “The Technical Educator;” “The Dictionary of Practical Engineering;” “Greater Industries of Great Britain;” and others are still progressing in the same admirable manner as heretofore.

DRINKING WATER IN CITIES: ITS BENEFICAL AND ITS DEADLY QUALITIES.

By THEO. S. CASE, Kansas City, Mo.

POTABLE waters in cities are obtained from cisterns, wells, and hydrants, and are usually regarded as comparatively pure in the order named—rain water being classed first, well water second, and river water third. How well this theory or belief is sustained will appear later.

A good, drinkable water is described as follows: “It is perfectly colourless and transparent, without smell or appreciable taste, but agreeable and not insipid or flat, does not lose its clearness by boiling, and leaves a very slight residue upon evaporation.” Drinking water, in addition to freedom from all organisms, from ammonia, nitrous acid and sulphuretted hydrogen, should not exceed eighteen to twenty degrees of hardness.

Rain water is naturally the purest of all for ordinary use; but unless special pains are taken in collecting and storing it, it is liable to contamination from a variety of sources, such as absorption of deleterious vapours and impurities from the atmosphere of localities largely occupied by manufacturing establishments, smelters of ores, &c., also from the dust, organic matters and other deposits washed from roofs into the cisterns; also from the salts of lead and copper dissolved out of the metallic roofs of buildings, and from foreign matters more or less offensive falling thereon and undergoing decomposition. Rain water is also, from its “softness,”—that is, absence of salts and chemical compounds—more liable to undergo fermentative changes than hard water, as well as more ready to form chemical combinations with metals, salts, and other substances.

Well and spring waters, which usually contain variable quantities of the compounds of lime, soda, potash, magnesia, and alumina, which are required in the economy of the system and which render them “hard,” are in consequence of their sparkling and greater thirst-relieving qualities, more agreeable as drinking water than any other; but in cities are not only more liable to contain an excess of these salts, dissolved from the soil in passing through it, but are also far more likely to be contaminated to a highly dangerous degree by sewage, waste of factories, and other filth, which may be present in poisonous amounts without imparting to the water either unpleasant taste or smell, and even without discolouring it in the least.

River water is usually less soft than rain water, and more so than well water, the latter condition being caused by the partial and gradual decomposition of its chemical compounds and the consequent deposition or precipitation of their bases. It is also far more largely contaminated by organic substances than either of the kinds of water before named, and is rarely to be found perfectly transparent in colour or perfectly attractive to the taste. However, it happens that there are compensations in the case of river water which do not obtain in either of the others, and which result in its purification to a far greater extent than is usually known. Among them are the fishes, frogs, and other living creatures and animalculæ which subsist upon the organic matters contained in it, and also the natural products of decay themselves, consequent upon their combination with the oxygen in running waters, such as nitric acid, which is itself antiseptic, carbonic acid, ammonia, &c., which escape from the water into the atmosphere. In addition to this it may be stated that even from the most populous cities the proportion of deleterious matter usually flowing into an adjacent stream, say one-twentieth in volume, is so small as compared with the whole volume of water itself, and is so purified by oxidation and other causes, that an analysis shows an astonishingly small quantity in a given amount of the mixture within a few miles from the source of the contamination.

Perfectly pure water, such, for example, as that derived from the melting of snow in the mountains, is believed to lack certain qualities demanded by the human system, and to tend at least to the production of goitre, cretinism, and scrofulous diseases of various kinds. Whether this is so or not, it is well established that waters containing moderate proportions of the salts of lime and carbonic acid gas are more agreeable to the taste as well as more conducive to health. Hence, we conclude that in their normal condition it is probable that the waters of wells and springs are preferable for drinking purposes to either of the others.

The consideration of the deleterious constituents of the potable waters of cities is a work of no small importance, and requires more time than I shall be able to bestow upon it this evening. But I shall endeavour to be sufficiently comprehensive in my remarks to excite an interest in the subject, which may result in some good to the community.

Cistern waters, as has been remarked, are liable to be contaminated by the gases, vapours, and other impurities of the atmosphere, which will be admitted to be by no means inconsiderable when we remember that the vapour arising from the ocean contains common salt and perhaps other mineral constituents in sufficient quantities to render it medicinal miles inland, while over large cities, where numerous manufactures are carried on, the gases arising therefrom modify the lower atmosphere very perceptibly, as is manifested in their discolouring and destructive action upon the materials of which the buildings and other structures are composed. Such mineral ingredients, when found in rain water in a much greater proportion than in ordinary well water, *i.e.*, in the proportion of more than fifty grains to the gallon, are necessarily injurious. But the principal sources of harm are the organic impurities arising from the decomposition of animal and vegetable substances, either washed in from the roofs or accidentally deposited therein, and from organisms floating in the air and precipitated by rain or snow. The former impurities may be filtered out or otherwise removed; but these minute organisms pass through all kinds of filters hitherto devised, and by their rapid propagation become the source of many diseases usually attributed to other causes. It is quite remarkable that some of these poisonous microscopic organisms are only found in closed wells and cisterns, while others are only found in those which are open and exposed to the action of the atmosphere. Among the deleterious organisms found in impure cistern water are Beggiatoa alba, schyzomycetes, the bacteria, monads, vibriones, and all organisms free from chlorophyll and promotive of decomposition of organic matter. Sanitarians differ as to the amount of organic matter, such as nitrates, ammonia, &c., which may be present in potable waters without rendering them unwholesome, but it is safe to say that when such contamination amounts to more than two or three grains of organic and volatile matter to the gallon, or ten to fifteen parts of chlorine in a million parts of water, such water should be condemned as unwholesome. And yet people drink with impunity, for years together, water containing larger proportions of organic matter than these. The answer to this is that “soil as well as seed” is required to produce a crop. The River Pollution Commissioners appointed by the British Parliament class as “suspicious” all stored rain water.

The water of wells is liable to be contaminated in a variety of ways without being affected in appearance, taste or smell, and it is not unusual to find, abounding in wells whose water has been regarded by those using it as especially pure, sweet, and wholesome, the elements of the most virulent and deadly blood poisons. These impurities may in part be traced to animal and vegetable substances thrown into the wells from the surface, through carelessness or malice, but the most deadly of them unquestionably come from the leachings of sewers, stables, and cesspools in their immediate vicinity. Public wells in crowded localities, and where horses and other animals are watered, are most liable to such contamination. I have in my possession the reports of a number of the Boards of Health of various cities in different parts of the country, north, south, east, and west, and the unanimous verdict of them all is that most of the well water in cities is more or less contaminated by these means, and that in by far the greatest number of cases the outbreaks of typhoid fever, diphtheria, and other zymotic diseases are due to the admission into the system of poisonous organisms by drinking well water impregnated with filth filtered through the ground in this way. The investigations of the British Health Commissioners elicited the fact that scarcely a well could be found in any of the beautiful, charming towns of England that was not an absolute source of disease to those using its waters, and that the older the town the more certain they were to find its waters thus contaminated and its death rate higher than in the newer localities. The researches of sanitary commissions in this country prove the same thing, and the reports from Providence, R.I., Rochester, N.Y., Dayton, Ohio, St. Paul, Minn., and Denver, Colo., all concur with the greatest unanimity in attributing the epidemics of typhoid fever, diphtheria, &c., which have scourged them respectively, to the same cause. In London another disease has recently made its appearance in crowded districts, which is regarded as a new form of Cyprus fever, and chargeable to impure water.

The nature of the soil upon which a town, or any portion of it is built, has much to do with its healthfulness in the matter of well water. For instance: it is easy to see that a loose, porous, or sandy soil is more readily permeated by fluids of all kinds, whether deleterious or not, than a dense, compact, and tenacious soil, and that the former is less likely to prove an efficacious filter than the latter. It is impossible to lay too great a stress upon this subject, and yet time will not admit of further discussion of it. In view of the fact that as a rule people are more fatally attached to their favourite wells than to any other of nature's gifts to them, it may be stated that some analyses made by the celebrated Dr. Frankland of well waters in England noted, famous for their sweetness of taste, sparkling brilliancy of appearance, and supposed dietetic wholesomeness, revealed the fact that so great was the amount of organic impurity present that the water was actually worth in the market two dollars per ton as manure.

While such a degree of filth contamination may not exist in many localities in this country, still revelations have been made by labourers, in excavating for cellars and foundations of buildings, even in some of the cities of the West, which have too clearly pointed out almost equally disgusting and alarming conditions.

The British Commission before referred to classed as "dangerous" the water of all shallow wells. Prof. Phipson regards the presence of phosphoric acid in well and river waters as undoubtedly a bad sign; and Dr. Frankland concludes that the development of fungoid germs cannot take place without the presence of phosphoric acid, or a phosphate, or phosphorus in some form of combination, and that water, however much contaminated, if free from phosphorus, does not produce them. Hence, we have this, in addition to other poisons, to look out for in our investigations of drinking water.

The deleterious qualities of river water are derived both from the decomposition of animal and vegetable matters, and also from the putrescent and putrescible substances carried into it by springs and brooks, sewers, drains from factories, &c., and consist of organisms similar to those described as existing in rain and well waters. To show to what extent the water of rivers is contaminated in passing by or through large cities it has been found by analysis that the Seine nearly doubles its proportion of mineral ingredients in passing through Paris, while its impregnation with organic matter is also largely increased. The River Thames receives so much organic matter from the sewers, factories, &c., of London as to render its waters below the city highly offensive, though above it its water is excellent in quality. Dr. Phipson analysed some water taken from the River Dart, which was so contaminated by sewage and refuse from chemical works that it poisoned and killed the fish. As above remarked, however, much of the impurity thrown into running streams is oxidized and rendered harmless within a few miles below the source of contamination.

Organic matters are largely present in all river waters, some of which are harmless even in large quantities, while the presence of others, such as putrid organic matter, numerous bacteria and micrococcus and minute white fungoid growths are, according to the best authorities, sources of imminent danger. The presence of nitrous acid is also to be regarded as a very serious matter. The British Commission already referred to classed as "dangerous" all river water to which sewage gains access. It may here be remarked that much of the organic and colouring matter found in river water is due to living green algæ and the products of the decay of leaves and other vegetable substances, which are comparatively harmless.

Thus it appears that each of these kinds of water is injuriously contaminated by the air or soil of cities to a degree and with a class of poisons almost impossible in the country, and that the water of wells in cities is to be regarded with most suspicion.

Resuming the subject of potable waters in general, we take up the consideration of the micro-organisms, heretofore spoken of, as regards their deleterious action upon the human system. Professor Barnard, in speaking of them, says in substance: The Infusorians, whose unaccountable readiness to spring up wherever decaying organic matter existed, first suggested their name, are found chiefly in fresh water lakes, rivers, and smaller streams, where they multiply in myriads, and are constantly swept about by the current. "It is commonly thought that pure drinking water is filled with these microscopic creatures, and it is sometimes said that they constitute the life of the water. All this is the opposite of the facts. Pure water is not inhabited by organisms; on the contrary, stagnant or impure water alone affords them subsistence. They hasten the destruction of the dead animal and vegetable matters the waters may contain, causing for the time being an infusion or fermentation of the liquid in question." "While their devouring work is a 'bottling up' of injurious and infectious matters, thus purifying our world, the substance their little bodies may contain and their parasitic action, when inoculated into the bodies of higher living organisms by contact, inhalation, eating, drinking, &c., render some kinds extremely dangerous as conveyers of the various contagious diseases."

It has long been taught by Prof. Austin Flint and others that the source of typhoid fever is a specific poison propagated through the alvine evacuations by contamination of the drinking water and atmosphere. The Boards of Health of Providence, Rochester, Baltimore, Cleveland, Dayton, Toledo, Minneapolis, Milwaukee, Denver, and Savannah, now in my possession, and in fact, all medical authorities, agree that such is the case, and that as our cities grow older their citizens go on storing up elements of destruction which nowadays only develop here and there cases of typhoid fever, diphtheria, and other dreaded diseases, but which, when the soil becomes impregnated beyond its capacity of neutralising the poison and imparts it unchanged to the air and drinking water, will produce just such horrible epidemics as have been known in the crowded cities of Europe and the East.

They also agree that most of these diseases have their origin in living organisms that chemistry would wholly fail to discover. Dr. O. W. Wight, of Milwaukee, states the case thus: "A few spores, invisible to the naked eye, of some deleterious cryptogam may enter the stomach with the drink, and there take root and increase into a growth of fatal disease. The ova of microscopic animalcules, or animalcules already full grown, may enter the system with drinking water and feed upon us till we die." Prof. Tyndall tells us that the spores of the *bacillus anthracis* killed nearly a thousand human beings, and more than 50,000 animals in five years in the provinces of Norgorod. Dr. Detmers, of Illinois, discovered in his investigations of hog fever, or cholera, a new order of bacteria or bacillus, which he believed to be the true seeds of this fatal disorder. This bacillus he determined by observation and experiment to be conveyed from one animal to another by means both of the air and the drinking water, which latter means of communication was conclusively shown by the fact that the course or progress of the contagion was down the stream in every instance, rather than the reverse.

It is apparent to all that the nature of the soil and the relative positions of the contaminating source and the well or stream, govern to a great extent the proximity that may be allowed between such objects. Shallow wells as a rule are more impure than deep ones. Wells, whose water comes from the surface of the first stratification of rock reached in digging, are naturally affected by whatever impurity gravitates into them. Wells in level ground without rock will drain a greater or less area, according as the soil is porous or not. Dr. A. N. Bell says that "the drainage of such a well extends from two to five feet in every direction for every foot in depth. Hence a well in compact soil, twenty feet deep, will drain a circumference eighty feet in diameter; in a porous soil a well of the same depth will drain a circumference two hundred feet in diameter, the well being in the centre."

It is generally believed that in passing or percolating through soils, especially those which are porous or sandy, the impurities of the foulest waters are removed, but such is far from being the case with the micro-organisms and subtle poisons resulting from putrefactive decomposition. These no filter can remove. This is clearly shown by the results of the chemical analysis of certain wells in the typhoid fever sections of Rochester, New York, by Prof. Lattimore. The soil underlying that city varies in density, but in all cases the water taken from these wells was clear, cool, sparkling, and contained no bad taste or odour, so that it might be regarded as thoroughly filtered, yet the analysis showed an average of 16·78 grains of common salt, and large proportions of free ammonia and albuminoid ammonia; thus disclosing beyond any question the disgusting origin of the water, or at least of its contaminating qualities.

Having thus examined the whole subject in a general way, the conclusions arrived at are that in cities fresh rain water, when obtained with proper precautions is the purest drinking water, river water next, and well water the most likely to be contaminated by dangerous substances and the most liable of all to deceive consumers; but that all of them contain greater or lesser amounts of deleterious ingredients, and that some of them are disgustingly foul and unwholesome.—Extracted from the *Kansas City Review of Science.*

"The Living Epistle, or the influence of Christian Character," is the title of a book announced by Messrs. W. B Whittingham.

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AND

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President, SIR ANTONIO BRADY.

THE SESSION 1879—1880

Members' Meetings will be held at 8.15 p.m. on Thursdays, January 8th and 22nd; February 5th and 26th March 11th and 25th; April 8th and 22nd; May 6th; and June 3rd.

At the meeting on the 22nd January, "Miners' Safety Lamps," by Mr. Purdey.

Annual General Meeting, Thursday, May 20th, at 4 p.m., unless otherwise arranged.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

Proceedings of the Institute.

The Report of Proceedings at the Inventors' Dinner will be found in another column.

Monthly Notices.

Steel from Cleveland Ores.—At the general meeting of the Newcastle-upon Tyne Chemical Society, Mr. R. C. Clapham, the President, drew attention to the manufacture of steel from the Cleveland ores. From this and the discussion which followed it appears that the elimination of the phosphorus from the iron is due to the magnesian limestone used in the lining of the convertor.

Solidified Bromine.—M. Philipp, at the suggestion of Rammelsberg, has redetermined the point at which bromine solidified. His process is described in *Ber. Berl. Chem. Ges.* for July. M. Philipp finds that purified bromine solidifies between −7·2 7·3. It has a brown colour and a conchoidal fracture, assuming a grey colour and a crystalline structure on exposure to the air.

Gold employed as a positive pole in sulphuric acid is rapidly oxidized and dissolved, according to M. Berthelot in *Comptes Rendus* and *Annales de Chimie*. This takes place only under the influence of the galvanic current.

Artificial Diamonds.—Mr. James Mactear, of the St. Rollox Chemical Works, submitted to the Glasgow Philosophical Society on Wednesday, the 17th inst., the results obtained by him after thirteen years' investigation into the artificial production of the diamond. Mr. Mactear has obtained specimens of pure transparent carbon having the refractive power of diamonds, which resist the intense heat of the blowpipe flame and the action of acids and alkalies.—*Athenæum*.

The Phrenologists intend starting a fresh journal with the new year.

The Psychological Society has dissolved itself in consequence of the death of Serjeant Cox.

Climatic Effects on Fruits, Flowers, and Herbs.—M. Nicolas de Nasakine, in *La Correspondance Scientifique*, maintains that the aroma of fruits increases with the latitude, while the sweetness decreases. The foliage and flowers of Northern trees are always vivid, and herbs are said to contain more essential oil in Norway than in Southern Europe. This is supposed to be due to the prolonged light of the summer months in Northern climes.

Phylloxera Vanquished.—M. Dalmas—so *Les Mondes* informs us—has succeeded in destroying the phylloxera by wrapping thin copper wire round the stems of the vine, and passing a current from a powerful voltaic battery through it. Both the mature insects and their eggs are said to be completely disorganised by the electricity.—*Athenæum*.

The death of M. Michel Chevalier, the well-known writer on political economy, is announced.

To dissociate the metalloids by exposing them to the influence of the extreme temperature, which can be obtained by concentrating the solar rays upon them by means of a gigantic metallic reflector, is proposed, in the *Archives des Sciences*, to be effected by M. Raoul Pictet, whose name is connected with the solidification of the gases.

Planets and Comets.—Now that we are so soon to enter upon a new year, it is curious, says the *Athenæum*, to look back a hundred years and reflect that at that epoch the number of known planets remained the same as in ancient times; since then, Uranus and Neptune, besides the whole group of small (now two hundred and ten in number) planets, have been discovered, whilst Mars has been found to be attended by two satellites, and three have been added to those of Saturn over and above the five known in 1780.

Dr. Percy, who it seems has resigned the position which he has so long and so ably filled as Professor of Metallurgy in the Royal School of Mines, objects to being removed to South Kensington. So do we, and we hope something will be done to prevent this piece of absurdity. The extreme west of London is an improper place for such an institution.

Lontin's incandescent wire lamp appears likely to solve the problem of applying electricity with economy as an illuminating agent. M. G. E. Hospitalier, in *La Nature*, describes this lamp, which consists essentially of an helix of platinum wire placed between two elastic terminals, which, when connected with the battary, elongate or contract the helix according to the amount of electricity used.—*Athenæum*.

The Scientific Review

JANUARY, 1880.

THE INVENTORS' DINNER, 1879.

The sixth annual Dinner of inventors, and members, and friends of the Inventors' Institute took place at St. James's Hall, Piccadilly, on 27th November, 1879; Sir Antonio Brady, President of the Institute, in the chair. Amongst those present were Mr. Wheelhouse, Q.C., M.P., Admiral Selwyn, R.N. (Vice-President), Mr. F. H. Varley, C.E., Mr. F. W. Campin, F.R.S.L., Mr. T. Waller, C.E., Mr. Newton Wilson, Mr. M. Zingler, F.C.S., Mr. J. Faulding, C.E., Mr. F. Braby, F.C.S., Mr. H. Studdy, Dr. J. M'Grigor Croft, Mr. J. L. Pulvermacher, Mr. J. Cadett, Mr. H. G. Hellier, Mr. J. P. Cutts, Mr. J. E. K. Cutts, Mr. T. Morgan, Mr. J. Greenfield, Mr. T. Blanchett, &c. The list of stewards also included the names of Sir Henry Bessemer, Sir Arthur Cotton, K.C.S.I., &c., Mr. Cromwell F. Varley, F.R.S., M.I.C.E. (vice-president Inventors' Institute), Mr. R. Richardson, C.E. (past treasurer Inventors' Institute), Sir H. De Burgh Lawson, Bart., &c., Mr. J. S. Farmer, C.E., Mr. J. Saxby, CE., Mr. S. Courtauld, Mr. W. Dempsey, C.E., Dr. Frank Scott, Mr. G. E. Pritchett, F.S.A., and Mr. D. J. M'Lauchlan.

After the dinner, which was a very excellent one well served, the Chairman proposed "the Queen and the Royal Family," which was loyally responded to.

The Chairman next gave "The Legislature."

Mr. Wheelhouse, Q.C., M.P., in responding to this, expressed regret that there was not a representative of the Upper House present, but remarked that that branch of the Legislature could take care of its own interests very well. As far as the House of Commons was concerned, he was sure its members felt that, as the elected of the people, they had large interests in their care, and that they never forgot that those interests required their most sedulous attention, but were anxious to bring that attention to bear even upon the most minute details. It should be also remembered that, as members of the Imperial Legislature, their first care should be to realise the fact that they had a duty to perform to every class of society, taking care to keep the level between the one and the other, so as not to allow either to get an undue prominence. The platform of our commercial interests was, after all, the most important one for this country, and prominent amongst these were industrial progress and invention.

The Chairman next gave "The Army, Navy, and Reserve Forces."

Admiral Selwyn, in acknowledging the toast, remarked, in reference to the Navy, that so many attacks had been made with regard to the present construction of ships that he was afraid that if inventors did not give them something which would remedy the present state of things the toast of the Navy would not continue to be received so enthusiastically as it was at the present time. (Laughter and cheers.)

The Chairman then gave the toast of "The Inventor's Cause," which he said was the cause of the nation. On the inventive genius of a people must depend its future trade and commerce. Unless we could undersell our neighbours by inventing better machinery, and promoting better manufactures and an improved taste among the people, this country "must go the wall." An endeavour was being made to induce the Government to give them what he believed would be one of the greatest blessings to this country—a good patent law. The great invention of Dr. Siemens was brought to this country because the German patent law at that time was worse than that of England. The genius of artizans should be encouraged as much as possible, and he believed that most of the inventions of this country had come from that class. It had been falsely said that patents were monopolies, but they were no such thing; they were simply a due reward to those who merited it. They now had £150 to pay for a patent, and at present what was obtained was simply a license to go to law.

Mr. Campin, in responding to this toast, stated that he was present under all the pressure of deep domestic bereavement, and should have asked to be excused from coming to a convivial meeting on that account, if he had not felt that it was his duty as Secretary of the Inventors' Institute to be present at all important gatherings having reference to the inventor's cause, which he deemed a high and holy one, and one having such a direct bearing on the prosperity of the nation that it was his manifest duty to be present; for it should be borne in mind that although everyone approved of the efforts of successful inventors, and no one rejected the practical benefits which were showered upon them by the operations of inventive genius, yet there were not many persons who were ready to come forward and work heart and hand for the cause like Sir Antonio Brady, Admiral Selwyn, and Mr. Varley. He was much pleased that that world-renowned inventor, Sir Henry Bessemer, who was a very old member of the Inventors' Institute, had placed his name on the list of stewards this year. He was sorry not to see him amongst them that night, though he was not surprised, as he knew that Sir Henry had no great liking for public meetings of any kind; however, it gave him much satisfaction to think that such an eminent inventor went with them heart and hand. Before he sat down he should like to remark that this dinner, like the five preceding it, was really and truly an inventor's dinner, and all who wished well to the inventor's cause were welcome to come, whether they held the same views on Patent Law reform as the Inventors' Institute, or had other views on the subject. (Applause.) The only creed to be held was promotion of invention and industrial improvement, by according justice to inventors. (Applause.) And he was sure that no efforts of statesmanship would do so much to alleviate the effects of depression of trade as this would; in short, it was the great practical question of the day, and it was not too much to say that amendment of the existing patent laws was absolutely necessary in order that the trade and commerce of the country should be maintained. (Cheers.)

Mr. H. Broadhurst said that the class he represented took a deep and increasing interest in this question, which was evinced by the unanimity displayed at their last congress at Edinburgh, in September, as to the necessity of a reform in the Patent Laws. This was not altogether due to pressure on the part of the officers of the congress, but to the extraordinary depression of trade under which we had suffered during the last two or three years. Workmen had learned many lessons, and there was no lesson they had more thoroughly learned than this one—that in order to maintain our position amongst the commercial and manufacturing nations of the earth, England must continue to improve in machinery and in every other branch of production. He had seen a paragraph in the newspapers showing that the Americans during the past twelve months had taken out two-thirds more patents than had been registered during the same period in England. The cause of this was that the American Government did all it could to promote the inventive genius of the people; but our patent laws seemed to be drawn with the idea of discouraging that genius. He hoped the Government would not be permitted much longer to neglect this important subject. For the last three sessions the Government had introduced a new Patent Bill, and each Bill, as far as he had followed them, had been better than the previous one. He hoped that now the Attorney General had given up accepting briefs in private practice, and was, he understood, devoting all his great talents to the service of the Government, a good, sound, healthy, and practical Patent Law Reform Bill was one of the questions upon which he was engaged. He was informed that the present Government intended to go through another session of Parliament, and in the forthcoming session they were determined to pay some attention to English interests at home; and if this be true, they had a right to expect of her Majesty's Government that this all-important subject should be one of the foremost questions to be dealt with in this domestic programme. He believed that the Attorney-General was desirous of passing a Bill on this subject, and he urged them to worry whatever Government might be in power until such a measure was passed. (Cheers.)

Mr. Wheelhouse advised that a Bill should be drawn up and printed, and if this were done he promised to take charge of it.

The Chairman next gave the "Inventors' Institute."

Admiral Selwyn, Vice-President, in reply, gave a detailed account of the proceedings at a congress which was held at Paris on the Patent Laws, and contended that the progress of the United States in arts and manufactures was wholly due to its protection of inventions. The result of the Paris Congress was that resolutions were passed which had been accepted as a *projet de loi*, which had been submitted to every Government as a basis of internaional law on industrial property. It was useless to give people technical education unless the results of that education were protected. The reform of the Patent Laws would do more to increase the prosperity f this country than any measure relating o the tenure of land, and many patents were now lost owing to the inability of he patentee to proceed with them. In 1852 the patent tax was reduced from £350 to £175, and whilst for some years previously to that date the number of paents registered was at the rate of 68 per nnum, since 1852 the number had aveaged 3,544 per annum.

Mr. F. H. Varley (Chairman Executive Council Inventors' Institute) also briefly esponded, by remarking that whatever views any one might hold on various points f amendment of the Patent Laws, he felt ure they must, if desirous of forwarding he good cause, be more or less in harmony with those of the Institute, which did not eek to aggrandise the inventor at the expense of the public, but simply to render he efforts of inventive genius more and more effectual for the public good (Cheers). Any other notions of its operations were misconceptions, and as an old member and ffice-bearer, he thanked them for coupling is name with the toast.

Mr. Newton Wilson also responded in ppropriate terms.

Mr. Pulvermacher then proposed the "Executive Council and Officers of the Inentors' Institute."

This was responded to by Mr. M. Zinger for the Executive Council; Mr. F. W. Campin, as Secretary; and Mr. J. P. Cutts, s Auditor.

At this stage of the proceedings Sir Anonio Brady left the chair, which was taken y Admiral Selwyn.

Mr. T. Waller then proposed the "Dine Committee," which was responded to y Mr. J. Greenfield and Mr. T. Morgan, pon whose rising there was much applause; and with the toast of the "Press" and the "Two Chairmen of the Evening," responses thereto, and some musical performances by the members of the Institute, the Sixth Inventors' Dinner ended.

FOREIGN SCIENCE.

Meteorologists are still occupied with the late wet and cold summer, during which, according to M. Renan, as registered at his observatory in the Park of St. Maur, outside Paris, the readings of the thermometer during July corresponded to the summers of 1758, 1795, and 1816. What is not less remarkable, the direction of the winds were nearly the same. The low temperature this season has not accompanied the north-west winds, but those from the west and south-west, which are naturally warm. M. Renan explains the matter as the consequence of the winds of Africa instead of passing westward, according to habitude, having deviated to the east of Europe. A corresponding phenomenon occurs at Senegal: the warmer the upper part of the river, the cooler is it at the seaside. M. Renan believes that severe winters are not the result of arbitrariness, but are constituted by groups of four or six around one more vigorous, and which he calls the central winter. He attributes the grouping to cosmical causes; perhaps deviations in the march of the winds might be nearer the truth. In any case, the alteration in the direction of the winds this summer has produced exceptional migrations of butterflies, which have infested the west of Europe since June, going southward. In some cases the sky was obscured by their passage, and they formed singed masses at the base of lamp-posts. They flew in groups at the rate of ten miles an hour; if they encountered a wall, the column rose vertically till it was crossed; then, after a moment's hesitation, the march southward was resumed without a stop to repose on a flower. Strange, no butterfly of the same species in the locality over which the group passed joined the migration.

A student school-mistress, aged 16 (says the Paris correspondent of our well-conducted contemporary, the *Kansas* (*U.S.*) *City Review*, from which we quote), was admitted into hospital, suffering from severe headache; she went to bed, and in the morning when she awoke she was completely blind. Dr. Abadie perceived that the surface of her body had become insensible; the forehead, neck, arms, and limbs, when touched with a lance, felt no sensation; no blood even flowed. He tried Dr. Burg's method, metallotherapy, and placed three pieces of gold on the left temple. In the course of fifteen minutes the patient commenced to see indistinctly; at the end of half an hour perfectly, but only with the left eye, the right remaining refractory to the metallic treatment. The patient was next placed on the insulated stool of an electric machine, and some sparks were eliminated from the neighbourhood of the orbit of the eye, In a quarter of an hour an amelioration was apparent, and continuing the plan every second day during a week, sight was restored.

M. Young has been studying the effects of poison on crustaceæ. Lobsters, cray-fish, and crabs are less susceptible to the effects of poison than vertebrate animals. They live very well in a solution of strychnine, because they eliminate it, but nicotine acts as readily on them as on us.

New colours have been extracted from cabbage and coffee.

"Sermonic Fancy Work," a little volume of smart papers on nursery rhymes, by Rev. John Paul Ritchie, of St. Helen's, which is out of print, is about to be re-issued by Messrs. W. B. Whittingham and Co., in a new form.

Proceedings of Societies.

ROYAL SOCIETY.

Nov. 20th.—The President in the chair. Mr. G. Matthey was admitted into the Society. The following papers were read:—"Experimental Researches on the Electric Discharge with the Chloride of Silver Battery: III. Potential at a Constant Distance and various Pressures, Tube Potential, Nature and Phenomena of the Electric Arc," by Mr. Warren De La Rue and Dr. Müller; "Researches on the Action of Organic Substances on the Ultra-violet Rays of the Spectrum: III. Essential Oils," by Messrs. Hartley and Huntington; "Preliminary Note on Magnetic Circuits in Dynamo- and Magneto-Electric Machines," by Lord Elphinstone and Mr. C. W. Vincent; "Preliminary Report to the Committee on Solar Physics on the Evidence in favour of the Existence of certain Short Periods common to Solar and Terrestrial Phenomena," by Messrs. Stewart and Dodgson; "On Definite Integrals involving Elliptic Functions," and "Values of the Theta and Zeta Functions for certain Values of the Argument," by Mr. J. W. L. Glaisher; "On the Normal Paraffins," Part III., by Prof. Schorlemmer; "Further Particulars of the Transit of Venus across the Sun, December 9th, 1874, observed on the Himaylaya Mountains, Mussoorie, at Mary Villa Station," Note III., by Mr. J. B. N. Hennessey; "On the Solubility of Solids in Gases, Preliminary Notice," by Messrs. Hannay and Hogarth; "On certain Definite Integrals," by Mr. W. H. L. Russell; "On the Action of Nuclei in producing the sudden Solidification of Supersaturated Solutions of Glauber's Salt," by Mr. C. Tomlinson; "On the Geometric Mean in Vital and Social Statistics," by Mr. F. Galton; "On the Law of the Geometric Mean," by Mr. D. M'Alister; and "Correction of Errors in his Paper on Diurnal Variations," by Mr. F. Chambers.

Nov. 27th.—The President in the chair. The following papers were read:—"On the Changes in Pepsin-forming Glands during Secretion," by Messrs. Langley and Sewall; "On the Structure of Serous Glands in Rest and Activity," by Mr. J. N. Langley; "Report on Phyto-Palæontological Investigations of the Fossil Flora of Sheppey," by Baron Ettingshausen; "A Memoir on the Single and Double Theta Functions," by Prof. Cayley; "On the Reversal of the Lines of Metallic Vapours," VII.; and "On the Spectra of Sodium and Potassium," by Profs. Liveing and Dewar.

Dec. 1st.—The anniversary meeting was held, the President in the chair. The statement of income and expenditure and the obituary list were read. The President delivered his anniversary address. The Copley Medal was presented to Prof. Clausius, the Davy Medal to M. Lecoq de Boisbaudran, the Royal Medals to Prof. Ramsay and Mr. Perkin. The council and officers for the ensuing year were elected.

GEOGRAPHICAL SOCIETY.

Nov. 24th.—Right Hon. the Earl of Northbrook, President, in the chair. The following gentlemen were elected Fellows:—Ibraham Helmy Pacha, Sir H. G. Booth, Major-Generals R. Biddulph, E. G. Bulwer, J. W. Cox, and F. Moberly, Cols. M. Hunter, D. Macintyre, G. C. Thomson, and F. W. E. Walker, Majors R. J. Maxwell and Serpa Pinto, Capts. C. K. Brooke, E. C. Browne, Lord Gifford, H. C. Reynolds, W. Shepherd, and D. W. Stephens, Lieuts. J. C. Bell, J. Ross, and Lucien N. B. Wyse, Revs. C. Davis and Dr. J. O. Means, Messrs. W. E. Baxter, B. P. Bidder, T. Bird, J. L. Bradfield, J. W. Bryans, C. Clauson, L. Dale, C. J. Follet, G. B. Glover, W. B. Guinee, H. Hayes, C. E. Hodson, W. P. Hutton, A. C. Johnston, C. C. Lees, C.

Lowenstein, A. Marshall, T. M'Clure, O T Olsen, W. G. Pedder, E. A. Petherick, C. M. Royds, W. H. Rodd, T. H. Sanderson, D. E. Saurin, R. L. S. Smyth, H. C. Stockley, M. J. Sutton, jun., F. Swanzy, F. Tayler, G. Waller, E. Wheeler, and J. S. Wilkinson. The paper read was "The Arctic Campaign of 1879 in the Barents Sea," by Capt. A. H. Markham.

Dec. 8th.—Right Hon. the Earl of Northbrook, President, in the chair. The following gentlemen were elected Fellows: Lieut.-General Sir J. M. Adye, Capt. H. S. G. Miles, Rev. J. Jordan, Messrs. J. T. Arundel, Mr. J. M. Flint, E. W. Johns, C. J. Longman, M. W. Mott, J. C. Rounding, A. W. C. Shean, M. Tait, G. Todd, J. M. Vickers, and F. Wyllie. The paper read was "A Visit to Nejd, Central Arabia," by Mr. W. S. Blunt.

GEOLOGICAL SOCIETY.

Nov. 19th.—H. C. Sorby, Esq., President, in the chair. Messrs. E. K. Binns and J. Dawson were elected Fellows. The following communications were read, "Supplementary Note on the Vertebræ of Ornithopsis, Seeley (= Eucamerotus, Hulke)," by Mr. J. W. Hulke; "On the Concretionary Patches and Fragments of other Rocks sometimes contained in Granite," by Mr. J. A. Phillips; and "On certain Geological Facts witnessed in Natal and the Border Countries during Nineteen Years' Residence," by the Rev. G. Blencowe.

Dec. 3rd.—H. C. Sorby, Esq., President, in the chair. Rev. J. L. Carrick, Rev. T. Dowden, Rev. J. R. Taft, Prof. E. W. Claypole, Messrs. Syed Ali, W. E. Baxter, A. R. Boyle, R. Gascoyne, G. M. Henty, J. Marshall, J. Martin, C. Maxted, E. Provis, T. W. Rumble, O. A. Shrubsole, S. R. Smyth, and W. N. Walter were elected Fellows. The following communications were read: "On the Gneissic and Granitoid Rocks of Anglesey and the Malvern Hills," by Mr. C. Callaway, with an Appendix on the Microscopic Structure of some of the Rocks, by Prof. T. G. Bonney; "Petrological Notes on the Neighbourhood of Loch Maree," by Prof. T. G. Bonney; and "On some Undescribed Comatulæ from the British Secondary Rocks," by Mr. P. H. Carpenter.

BRITISH ARCHÆOLOGICAL ASSOCIATION.

Nov. 19th.—Mr. T. Morgan in the chair. After the election of many new members, reference was made to the Saxon church of Escombe, near Bishop's Auckland, the discovery of which had been communicated to the Congress by the Rev. Dr. Hooppell. The building is entirely of Saxon date, all the walls being original and even the gables. The height, as is usual in buildings of this early date, is great for the size. This is in the nave 24 ft. 4 in., while the extreme length of nave and chancel is only 56 ft., width 14 ft. 4 in. The chancel arch is a plain semi-circle, and only 5 ft. 3 in. wide. All the walls are built of squared stones brought from the Roman station at Binchester (Vinorium), and the name of the Sixth Cohort has been met with built up among the walling. Escombe is a secluded village, and to this must be attributed the fact that the existence of this most interesting structure should have remained unknown until now. The plans will appear in the next part of the Society's *Journal*. Mr. L. Brock made mention of the proposal before the Italian Government to rebuild the front of St. Mark's, Venice. This work was strongly condemned, and a resolution to that effect was carried unanimously. The Rev. Prebendary Scarth reported the further discovery of important Roman remains at Bath, and Mr. C. Lord exhibited some remarkable earthenware pipes, with neatly worked joints, found under the Roman camp at Soddington, near Edgbaston, where, the chairman pointed out, similar remains were found in 1817. Mr. Turner described a curious class of biers remaining in some of the Norfolk churches, and Mr. Watling exhibited a large collection of transcripts of ancient glass, &c., from Norfolk and Suffolk. The Rev. S. M. Mayhew read an elaborate paper "On the Antiquities of the Isle of Man," referring especially to the interlaced crosses and the curious little churches known as "creels." The proceedings were brought to a close by the portion of a paper "On the Results of the recent Congress," by the chairman, but the conclusion had to be deferred for want of time.

Dec. 3.—T. Morgan, Esq., in the chair. Several interesting documents relating to Wells Cathedral were exhibited by the Rev. Canon Bernard, among them being a little known grant by King Edgar of land at Stanton, Wilts, and attested by Dunstan and several dignitaries of the period. Mr. W. de Gray Birch described an inscription on an external buttress of the same cathedral, announcing thirteen days of pardon for all who might pray for the soul of John de Putney. Mr. Mann described some remarkable Roman sculptures, consisting of architectural members, several very elaborately carved. These have recently been found at Bath. Mr. J. T. Irvine reported the discovery of the foundations of the long-lost bell-tower of Lichfield Cathedral. The ancient records report that this stood in the Close, and that it was burned in 1315, since which time its site has been unknown. It has been found on the north side of the cathedral, near the Chapter House, in excavating for a new stable in the bishop's grounds. A mass of calcined flooring tiles was first met with, covered with a coating of melted bell-metal, and aftewards the foundations of the massive walls. Mr. E. P. Loftus Brock exhibited a series of Italian salt-cellars of pottery of very diverse form, but identical with those noticed in English pictures of the fifteenth and sixteenth centuries, showing the generality of form in many articles of domestic use. The chairman concluded his paper on the results of the recent Congress, and Mr. G. R. Wright called attention to the much discussed question with respect to the birthplace of Anne Boleyn. He quoted from Spelman that she was born at Blickling Hall, and asserted that this might be taken as conclusive evidence, since he was so nearly a contemporary writer. The proceedings were brought to a close by a paper "On the Trethevy Stone, Cornwall," by Mr. C. W. Dymond. This is a cromlech standing on a low well-defined mound, and presenting no appearance of having ever been covered over. All evidence is in favour of the belief that it was built as it now stands. A hole in the top stone may have been to receive the base of a cross in mediæval times.

NUMISMATIC SOCIETY.

Nov. 20th.—Dr. J. Evans, President, in the chair. The Rev. Canon Pownall exhibited a coin of one of the types of Edward the Confessor struck at Thetford, but bearing instead of the name of Edward that of Eadred Rex, and on the reverse Atser on Thetfor—Atser being a known Thetford moneyer of Edward the Confessor. Canon Pownall also exhibited some counterfeit base shillings of Edward VI. without any trace of silver remaining upon them. Mr. P. Gardner read a paper "On some Coins brought from Kashgar by Sir Douglas Forsyth." Among these were two of iron, probably of a local issue. One of them bore a name resembling that of Hermæus, the Greek king of Bactria, in Aryan letters, and on the reverse some Chinese characters. Mr. H. Howorth supplemented the paper with a short dissertation on the ancient geography of Kashgar. Mr. J. White read a paper "On the Iron Money of the Japanese," and exhibited a selection of twenty specimens, together with a bronze coin of the same size, equal in value to the twenty iron coins. Mr. White said that although the iron coins were only worth about the hundredth part of a farthing a piece, some small articles were to be purchased with them, but that they were chiefly used for the giving of alms and as offerings to the gods.

STATISTICAL SOCIETY.

Nov. 18th.—T. Brassey, Esq., M.P., in the chair. After the election of seventeen new Fellows, the President delivered his inaugural address, the subject being "Agriculture in England and the United States." At the close of the address the President presented the Howard Medal and £20 to Miss Beatrice A. Jourdain. The President then announced the subject of the essay of next year, viz., "The Oriental Plague in its Social, Economical, Political, and International Relations.

ZOOLOGICAL SOCIETY.

Nov. 18th.—Prof. Flower, President, in the chair. The secretary read a report on the additions to the Society's menagerie during June, July, August, and September. Letters and papers were read: Mr. H. O. Forbes, on the distribution of the Badger-headed Mydaus in Java; from Dr. A. B. Meyer, in which the habitat of *Cervus Alfredi* was stated to be Samao and Leyte islands of the Philippine group. Mr. E. R. Alston exhibited some mammals collected by Mr. W Ramsay, 67th Regiment, and one of the typical skulls of *Tapirus dowi* (Gill), which had been entrusted to him by the authorities of the U.S. National Museum. Prof. Flower made remarks upon the skull of a White Whale (*Delphinopterus leucas*) recently obtained in Sutherlandshire. Communications were read: from Mr. J. L. Taczanowski, on a new Synallaxis from Peru, which he proposed to name *Synallaxis fruticola*, and a new Myiarchus from the same country, proposed to be called *M. cephalotes*, and on some birds of interest recently received from Turkestan; from Capt. Shelley, on a collection of birds made in the Comoro Islands, received from Dr. Kirk at Zanzibar: the collection contained 186 specimens; a Zosterops which appeared to be new was named *Z. Kirkii*, in acknowledgment of the assistance rendered to ornithology by Dr. Kirk; by Capt. Shelley, on two new species of African birds. Lieut.-Col. H. H. Godwin-Austen read a description of the female of *Lophophorus Sclateri*, Jerdon, from Eastern Assam. Communications were read: from Dr. Goodacre, on the identity of the common and Chinese geese; from the Rev. O. P. Cambridge, on some new and rare spiders from New Zealand, with characters of four new genera; on some African species of Lepidoptera, belonging to the sub-family Nymphalinæ, by Mr. W. L. Distant; and by Mr. R. G. W. Ramsay, on a new Oriole from North-East Borneo, which he proposed to call *Oriolus consobrinus*.

Dec. 2nd.—Prof. Newton, V.P., in the chair. The secretary read a report on the additions made to the Menagerie during October. Letters and papers were read: from Mr. E. L. Layard, advocating the desirability of a fixed scale of colour for use among naturalists in describing the plumage and pelage of birds and other animals; from Mr. R. B. White, on a mode of protecting plantations from the ravages of an ant (*Atta cephalotes*); from Dr. G. E. Dobson, on some species of Chiroptera from Zanzibar, with descriptions of new and rare species; from the Prince L. Lubomirski, on a collection of Shells made in High Peru by Messrs. Jelski and Stolzman; by Mr. G. F. Angas, on two new species of Helix (Eurycratera), from south-east Betsileo, Madagascar; by Mr. A. G. Butler, on some Arachnida of Madagascar and the Mascarene Islands, in which an account was given of a collection of spiders recently received by the British Museum from Réunion and Mauritius, through Mr. H. H. Slater; by Lieut.-Col. H. H. Godwin-Austen and Mr. G. Nevill, on two collections of Land Shells obtained at Perak and in the Nicobar Islands by Surgeon-Major E. Townsend and Dr. F. Stolizka; from Dr. A. Gunther, containing a notice of a collection of Mammals and Reptiles recently received from Cyprus by Lord Lilford; and by Dr. F. Day, on the Fishes of Weston-super-Mare.

ENTOMOLOGICAL SOCIETY.

Nov. 5th.—H. W. Bates, Esq., V.P., in the chair. Mr. T. R. Billups was elected an ordinary member. Mr. W. C. Boyd exhibited a remarkable variety of *Aspilates citraria*, a specimen of *Cidaria testata* in which the hind wings were apparently absent, and a Noctua resembling *Hadena dentina*, but differing from that species in the form of the body. Mr. McLachlan read some remarks he had received from Prof. Forel relative to the sculptured stones on the shores of Lake Leman. Three principal types of markings were described, the first of which was ascribed to the agency of Tinodes. Prof. Westwood exhibited a series of drawings illustrating the economy and transformations of several species of trichopterous and other neuropterous insects; also drawings of some undescribed species of exotic heteropterous Hemiptera contained in the Hopeian collection; he likewise drew attention to a modification of the professorship which had been proposed by the Oxford Commissioners, whereby the science of entomology would probably be neglected, and which would to a certain extent render nugatory the intentions of the founder of the professorship and donor of the collections. Prof. Westwood also referred to the affinity of the genus Polyctenes. Mr. J. J. Weir exhibited some ants, apparently a species of Atta, which he had found in large quantities at Pisa, and which were peculiar in having collected around their nests large quantities of small empty shells of *Helix capuata* and *H. virgata*. Mr. Weir also exhibited a specimen of an Orgyia, stated on the authority of Mr. Gates to have emerged from the larval skin without passing through the pupal condition. Mr. W. L. Distant communicated a note relative to some Indian Hemiptera he had received from India through Mr. F. Moore for examination, with the names of the plants on which they were found. The following papers were also communicated: "List of the Hemiptera collected on the Amazons by Prof. Trail," Part I., by Dr. F. B. White; "Descriptions of New Genera and Species of Tenebrionidæ from Madagascar," by Mr. F. Bates; and "Descriptions of New Coleoptera from East Africa and Madagascar," by Mr. C. O. Waterhouse. Mr. Butler communicated a paper "On the Natural Affinities of the Lepidoptera hitherto referred to the Genus Acronycta of authors." From an examination chiefly of the larval characters, the author proposed to distribute the British species of the genus among the Arctiidæ, Liparidæ, Notodontidæ, and Noctuites.

CHEMICAL SOCIETY.

Nov. 20th.—Dr. Gilbert in the chair. The chairman announced that a ballot for the election of Fellows would take place at the next meeting, December 4th. The following papers were read: "A Chemical Study of Vegetable Albinism: Part II. Respiration and Transpiration of Albino Foliage," by Mr. Church; "Contributions to the History of Putrefaction," Part I., by Mr. C. T. Kingzett; "Notes on Manganese Dioxide," by Messrs. C. R. A. Wright and A. E. Menke; and "On the Reaction between Sodium Thiosulphate and Iodine: Estimation of Manganese Oxides and Potassium Dichromate," by Mr. S. Pickering.

Dec. 4th.—Mr. Warren De la Rue, President, in the chair. The following papers were read: "On the Comparative Value of Different Methods of Fractional Distillation," by Mr. F. D. Brown; "On the Influence exerted upon the Course of certain Chemical Changes by Variations in the Amount of Water of Dilution," by Messrs. M. M. P. Muir and C. Slater; "On the Influence of Temperature upon the Decomposition of Barium chloride by Potassium Oxalate in Aqueous Solution," by Mr. M. M. P. Muir: "On α and β Phenanthrene Carbonic Acids," by Dr. F. R. Japp; and "On some Derivatives of Phenylacetic Acid," by Mr. P. P. Bedson.

METEOROLOGICAL SOCIETY.

Nov. 19th.—Mr. C. Greaves, President, in the chair. The following gentlemen were elected Fellows: Capt. C. K. Brooke, Rev. E. Carr, Capt. R. A. Edwin, the Earl of Northesk, Dr. J. Robb, Messrs. W. B. Fawcett, C. J. Harland, J. Lucas, H. Mellish, G. B. Nichols, T. H. Walker, and C. L. Wragge. The Reports on the Phrenological Observations for 1879 were read, the Botanical being by the Rev. T. A. Preston, the Entomological by the Rev. C. H. Griffith, and the Ornithological by Mr. J. Cordeaux. With the exception of a few days in the earlier parts of February and of March the temperature of 1879 has been almost invariably below the mean, accompanied with wet and little or no sun. Foliage has, as a rule, been excessively luxuriant and dark, "forming the most remarkable feature of the year"; but rarely has fruit been able to ripen, and the second shoots have frequently been weak and unhealthy. Flowering has invariably been late, as much as a month in some districts; the hay harvest often not completed till nearly the end of August, some still in "cock" in the moorland district of Staffordshire as late as September 30th; and the corn harvest not only extremely late, but the corn not properly ripened. With regard to insects, the two most notable occurrences have been the swarms of *Pyrameis Cardui* and *Plusia gamma*; both these species have been wonderfully numerous, especially the latter. The severity of the winter caused an almost unprecedented mortality amongst birds, a mortality most apparent amongst the Turdidæ and the Starlings. Spring brought little or no improvement; birds nested much beyond their average time, and in a vast number of instances the first eggs have been addled and destroyed by cold rains and an abnormally low temperature. The scarcity of young partridges is unprecedented. A paper "On the Meteorology of Zanzibar," by Dr. J. Robb, was also read.

PHILOLOGICAL SOCIETY.

Nov. 21st.—Dr. J. A. H. Murray, President, in the chair. Major-General Moberly, Messrs. J. P. Postgate, H. Belcher, T. R. Gill, and T. C. Button, were elected members. Mr. H. Sweet gave a verbal account of Prof. Bugge's recent researches on Scandinavian mythology, tending to show that much of it was of recent origin, and borrowed from Greek and Jewish sources. Prince Louis Lucien Bonaparte read a paper "On Portuguese Simple Sounds, compared with those of Spanish, Italian, French, English," &c., accompanied by a printed table with the sounds in his own characters and in palæotype, each with an example in Portuguese orthography. The chief peculiarity was in the vowels, of which the Prince acknowledged fifteen, five being nasal, with a nasality different from the French. There were twenty consonants, mainly remarkable for their varied and peculiar orthography. The orthography of Portuguese is about as anti-phonetic as English or French. There is no proper quantity of vowel, there is no musical accent, but an ordinary stress. The pronunciation differs from Spanish as much as Spanish from English. The pronunciation given referred to Lisbon only at the present day.

SOCIETY OF ARTS.

Nov. 24th.—The first of the present course of Cantor Lectures "On Bread and Bread-Making," was delivered by Dr. C. Graham.

Nov. 26th.—Lord A. S. Churchill in the chair. Fourteen candidates were proposed for election as members. A paper entitled "Suggestions for Dealing with the Sewage of London" was read by Major-General Scott.

Dec. 1st.—Dr. C. Graham delivered the second lecture of his course "On Bread and Bread-Making."

Dec. 3rd.—Prof. Huxley in the chair. Six candidates proposed for election as members. The paper read was "On Apprenticeship: Scientific and Unscientific," by Prof. S. P. Thompson.

Dec. 8th.—The third lecture of his course "On the Chemistry of Bread and Bread-Making" was delivered by Dr. C. Graham.

Dec. 10th.—Sir J. D. Forsyth in the chair. Six candidates were proposed for election. Mr. W. Simpson brought before the society the result of some recent explorations in the Jellalabad Valley in a paper "On Art Vestiges in Afghanistan," in which he described some interesting discoveries he had made with regard to the ancient art of that country.

PHYSICAL SOCIETY.

Nov. 22nd.—Prof. W. G. Adams in the chair. Prof. Reilly and Prof. Heath were elected members. Prof. Guthrie exhibited a new photometer in its crude form, and demonstrated its action to the meeting. Prof. Reinold read a paper by Prof. Rucker "On a Suggestion as to the Constitution of Chlorine offered by the Dynamical Theory of Gases;" and Dr. Shettle read a paper "On the Influence of Heat upon certain Forms of Induction Coils, considered more especially in Relation to the Inductive Power which the Blood exercises on the various Structures of the Body."

SOCIETY OF ANTIQUARIES.

Nov. 27th.—F. Ouvry, Esq., V.P., in the chair. Mr. Ouvry stated that Lord Carnarvon was prevented by indisposition from taking the chair. Mr. C. Knight Watson, secretary, stated that in the summer the council had appointed a committee, called the "Historical Monuments and Documents Committee," to consider what steps should be taken to carry out the valuable suggestions made by the President, Lord Carnarvon, in his address on St. George's Day. The council felt that the credit of the society was involved in not allowing these suggestions to lie dead. The committee, who had received great assistance in their labours from Mr. E. A. Bond, Principal Librarian of the British Museum, had drawn up a report in the shape of a memorial to the Lords of the Treasury, which had been adopted by the council and ordered to be submitted this evening for the information of the society, and then to be transmitted to the proper quarter. The secretary further stated that he had been instructed by the council to lay before the society a letter which had been forwarded by the President, at the request and in the name of the council, to the Secretary of State for Foreign Affairs with reference to St. Mark's, Venice. Messrs. O. Morgan, H. Reeve, C.B., and G. E. Street, R.A., addressed the meeting on the subject of St. Mark's and deprecated the alleged intention to restore the west front. Mr. Street warned the society that it would be necessary to exercise vigilance in ascertaining whether the instructions from the central authorities at Rome, especially as there seemed some conflicting jurisdiction between two departments of the State, were duly attended to at Venice. His experience told him that this could not be implicitly relied on. Mr. Ouvry exhibited a beautiful MS. of the Vulgate, probably of the thirteenth century, which had formerly belonged to Dr. Adam Clarke. Mr E. Freshfield communicated some remarks on an Illuminated Calendar contained in six leaves of parchment, which had been brought for exhibition by Mr. Joseph Clarke, F.S.A. Mr. Freshfield believed this Calendar to have been drawn up soon after 1372, though there were entries as late as the seventeenth century. From its general character Mr. Freshfield conjectured it had originally been prefixed to a parish record, and this had reminded him of a similar Calendar which he had seen in the muniment room of the parish of St. Stephen's, Coleman-street. He had compared the two together, and by the kindness of the churchwardens of that parish he was able this evening to allow the Fellows to do the same, by bringing for exhibition the curious parish books. It was to an account of these books that the remainder of Mr. Freshfield's elaborate paper was devoted. The most curious is the Book of Records, which contains the Calendar in question, and of which the earliest portion is certainly not later than the reign of Edward IV. In addition to the usual fixed saints' days, which are more numerous than in Mr. Clarke's Calendar, it specifies some peculiar to the parish. The word "Pope" has been erased, and in one instance (probably in Mary's reign) reinserted. At the end of the Calendar follows an inventory of the goods of the church, under different headings, such as jewels, latten, pewter, missals, graduals, vestments, altar-cloths of work, towels of work, hangings for the altar, &c. The date of this inventory is 1466, and it is followed by another of the year 1542. It is very curious, with regard to the books in the latter inventory, that all those which were "not Salisbury" had been sold, as if in the latter part of Henry VIII.'s reign there had been some attempt to establish uniformity by restricting the "use" as far as possible to that of Sarum. Mr. Freshfield went into copious details, affording a most interesting glimpse into a London parish. These books appear to be in many respects the most important in the City of London.

Dec. 4th.—F. Ouvry, Esq., V.P., in the chair. Mr. T. G. Elger communicated an account of two leaden coffins which had been discovered last August in a field called Tower Hill, about two hundred yards to the west of Sandy station on the Great Northern Railway. Mr. Elger conjectured that Tower Hill may be found to have been the cemetery of the Roman station. Mr. R. Day communicated an account of a leaf-shaped bronze spear-head, 23 in. long by 2¼ in. in the widest part of the blade, which had been discovered while dredging the river between Queenstown and Cork, in the Blackrock Reach, about two miles from Cork. It was stated that a similar spear-head had been discovered six months ago, but had been thrown away by the dredgers as valueless. Mr. G. Payne, jun., exhibited one of the most remarkable "finds" of Roman remains that have ever been laid on the society's table. The locality where they were discovered is the site of a Roman interment, at Bayford, near Sittingbourne, Kent, which two years ago (May, 1877), furnished the materials of an exhibition of scarcely inferior interest with which Mr. G. Payne favoured the society, and for which he received the appointment of local secretary. This second interment, which was opened on the 6th of November last, lay about twenty yards from the previous one, and nothing but the most zealous care of an accomplished antiquary and an experienced excavator could have exhumed the objects found in such marvellous preservation. Among the most interesting of these objects may be mentioned a square cinerary vessel of blue glass, of unusually large dimensions; a small pale greenish-blue glass jug, with a handle twisted at the rim into a loop; a pale olive-green glass bottle, height 9¼ in., with two handles, a very unusual feature; a bronze vase, a most remarkable object, height 10⅛ in., extreme width 6¼ in. The handle is of massive metal, and on it, in high relief, is stamped the nude figure of a man, an uplifted sword in the right hand, in the left is the scabbard, and over the arm is thrown a cloak; under the right hand is a decapitated ram or goat, legs uppermost, with blood dropping from the neck, the head having fallen at the man's feet. Between his legs reclines an ox, and next the left leg is seen the head of a boar, probably animals destined for sacrifice. Above the man's head the decoration is continued up the handle. Here a goat is figured galloping, over it are two animals of some kind, and above them is the figure of a man, seated, holding a crook in the right hand. The handle is encircled with a band of siver, and the rim is clasped by the heads of two birds, with eyes of silver, and the beaks drilled with holes as if to represent teeth. Along with these objects were urns of Upchurch and Samian ware, and a curious saucer of unknown delicate cream-coloured ware; there were also fragments of bronze strigils and a very curious kind of bronze rack, in the shape of the letter D, which seemed to have been used for suspending both the strigils and also a bronze bowl, of which fragments were exhibited. Mr. R. S. Ferguson laid before the society a report on the archæology of Cumberland. In this report perhaps the most interesting circumstance was the rediscovery of a Roman inscribed stone, found at Bowness on Solway in 1790, but which had since been lost sight of. Dr. Bruce was unable to find it, and omitted it in his "Lapidarium." Mr. Ferguson was fortunate enough to get a clue to it, and ultimately identified it. It now exhibits no trace of what forms the sixth line in Hutchinson's "Cumberland," vol. ii., p. 486, where the original discovery was recorded and the inscription itself egregiously misread. Mr. Ferguson doubted whether it had ever existed. It also appeared that the site of the Roman camp, which Hutchinson (ii. 346) states to have existed at Mowbray on the Solway, has recently been ascertained and identified. Its foundations have been excavated and laid bare in a field near Beckfoot, three miles from Mowbray, and close to Newtown. Mr. Ferguson exhibited fragments of a pewter chalice and paten, found during some alterations at Kirkoswald Church; also a MS. in Amharic characters, brought from Magdala during the Abyssinian war.

ROYAL SOCIETY OF LITERATURE.

Nov. 26th.—C. Clark, Esq., in the chair. Mr. C. F. Keary read a paper "On some Aspects of Zeus and Apollo Worship." The aspects in which these two divinities were specially regarded were as nature gods, and in a worship belonging rather to the prehistoric than to the historic ages of Greek life. The individuality of any god sprang, the writer maintained, not from the exercise of fancy, such as might give their characters to the personages of a drama, but from genuine experience. This experience was of the forces or the appearances of nature, with which are originally identified the divinities of any polytheism. The change from pure phenomenon worship to anthropomorphism first began by the transfer of power from a fixed phenomenon to one which was more arbitrary. The writer then proceeded to examine the various modifications which had taken place in the characters of Zeus and Apollo before they appeared in the guise in which they were known to historic Greece.

LINNEAN SOCIETY.

Nov. 20th.—Prof. Allman, President, in the chair. Messrs. W. Jones and W. Wickham were elected Fellows. Sir J. D. Hooker exhibited a specimen of cedar from Cyprus, to which, from the shortness of the leaves and smallness of the female cones, the name *Cedrus Libani*, var. *brevifolia*, is applicable. In a paper accompanying the exhibition Dr. Hooker mentioned that the knowledge of this variety of cedar of Lebanon was due to Sir S. Baker, from whom a letter was read. In comparison with the above Prof. Allman laid on the table examples of cone-bearing *Cedrus deodara*, grown by Mrs. C. St. Clair at Parkstone, Dorset. Mr. E. M. Holmes exhibited and made remarks on a series of rare British lichens, hepaticæ, and freshwater algæ. He also showed the leaves, flowers, and portion of the trunk of the tree *Audira araroba*, yielding the so-called Goa powder. This vegetable secretion appears to destroy the woody tissue and ultimately itself to become deposited and fill the cavities of the heart wood. Only recently it has been found that the tree belongs to Bahia, is sent to Lisbon, and thence exported to the Portuguese colonies of the East, whence its name Goa. Mr. Christy showed a bottle of chrysophanic acid, the product of the tree above mentioned; and he pointed to two aboriginal Australian skulls with occipital thickening, supposed to be induced by the blows of the natives knobkerries. A paper, "Contribution to our Knowledge of the Embryo Sac of Phanerogams," was read by Mr. M. Ward. He delineates the growth and development of the parts in question in *Butomus umbellatus*, *Alisma plantago*, and several other forms as studied in microscopic sections. The accounts given by and the views of Strasburger, Vesque, and Warming are compared and reviewed. The author states that the ovule out of its cell growth has one cell group which leads in growth, and, fulfilling a special purpose, becomes the embryo sac. Further feeble division of this produces a watery cell with two nuclei. Each nucleus again produces four nuclei, and one from the top group moves towards the middle sap-cavity. Each group of four cells is a prothallus and the cell producing this a macrospore. The two most successful macrospores behave similarly to those of some vascular cryptogams, and finally germinate, producing a ruddy prothallus of four naked nuclei. The egg cell is an oosphere. The extinct land tortoises of Mauritius and Rodriguez formed the subject of a paper by Mr. Alf. Haddon. An examination of a large series of bones obtained by Mr. E. Newton and deposited in the Cambridge Museum corroborates the Mauritian species *Testudo triserrata* and *T. inepta*, described by Dr. Gunther, but it adds no fresh example of the unsatisfactory species *T. leptocnemis*. That named *T. Vosmæri* is alone distinguishable from Rodriguez. Many examples show great tendency to variation in ankylosis of coracoid with the shoulder girdle. A second zoological contribution, "On Greenland Crustacea collected by Mr. Whymper," by Mr. E. J. Miers, was read in abstract.

Dec. 4th.—Prof. Allman in the chair, Messrs. S. Wright, G. M. Thomson, J. G Otto Tepper, H. B. Spotton, J. Cameron, Major Collett, and Sir S. Wilson were elected Fellows. Mr. Carruthers exhibited a bottle of Pteropods (*Spirialis retroversus*), obtained in abundance by Dr. J. Grieve in the Gareloch, Ross-shire, July, 1879. The latter states they swam rapidly to the surface, rising with a perpendicular fluttering motion, and having reached the top they raised their wing-like appendages above their heads, and, thus upholding them motionless, would then drop quietly to the bottom. Dr. M. Masters gave a communication "On certain Relations between the Morphology and the Functions in the Leaves of Conifers." Quoting the labours of Bertrand, M'Nab, and others, he proceeded to show that the leaves of the silver firs (Abies) are endowed with a power of motion, in virtue of which they are raised or depressed; on the contrary, the leaves of the spruce firs (Picea) are comparatively motionless. In the former there is a well-marked layer of "palisade cells," which are absent in the leaves of the latter. The author thus correlates these differences with varying degrees of functional activity and with adaptations manifested to secure to each leaf a favourable exposure to light, &c. Allusion was also made to the rotation of the "leader-shoots" of many conifers during the season of active growth. Prof. P. M. Duncan read a paper "On a Synthetic Type of Ophiurid. This specimen was dredged by Dr. Wallich, Bulldog expedition, 1860, from a depth of 228 fathoms, off East Greenland. In shape and dental characters it approaches Amphiura; its spinules and arm hooks are those of Ophiothrix; and as regards accessory plates they resemble those of Ophiolepis. This remarkable Brittle-Star, named by the author *Polyopholis echinata*, well exemplifies the difficulty of asserting nearest affinities, when ambiguously it possesses characters of several groups; that provisionally assigned it is among the family Amphiuridæ. Prof. Duncan points out that such a form, although rare, nevertheless destroys the rigid lines of demarcation in the grouping employed by some authors. Mr. C. B. Clarke followed by a paper "On Indian Begonias." This is supplementary to the author's account of the group in Sir J. D. Hooker's "Flora of British India." It treats of the classification of the whole genus (*i.e.* order) except Hillebrandtia and Begoniella, and it is maintained that it (the group) can be naturally divided into the six subgenera employed in the "Flora of British India." The author discards the differences in the stamens and styles for sub-generic characters, and employs exclusively the structure and dehiscence of the fruit.

INSTITUTION OF CIVIL ENGINEERS.

Dec. 2nd.—Mr. Bateman, President, in the chair. Fifty-four candidates were balloted for and duly elected, viz., Messrs. A. P. de M. Barretto, P. M. Barnett, J. R. Bell, G. R. Clark, C. Fouracres, T. Hamilton, J. Hindle, H. W. Hudson, J. Kraft, H. C. Mais, R. Riddell, W. Scott, and W. H. Spalding, as members; Messrs. E. H. Allies, R. J. Brough, J. S. Brown, Stud. Inst. C.E., R. F. Bullen, G. Chamier, W. B. Dawson, M.A., Stud. Inst. C.E., J. Dickson, jun., Stud. Inst. C.E., B. Fitch, S. S. Grant, H. Hawes, H. E. H. Haynes, B. D. Healey, G. F. H. Heenan, J. H. Home, J. C. Johnston, E. C. Jones, F. E. Linging, D. Macfarlane, Stud. Inst. C.E., T. May, R. L. Mestayer, W. H. Morrow, J. W. Parry, Stud. Inst. C.E., J. Paterson, J. Ponsford, J. Price, jun., Stud. Inst. C.E., A. C. C. Rogers, F. Simpson, Stud Inst. C.E., J. G. Single, A. Singleton, T. Smith, A. Sulivan, Stud. Inst. C.E., F. H. Trevithick, C. Vincent, Stud. Inst. C.E., R. Walker, C. P. Whitcombe, and R. A. Wilkinson, as associate members; and Capt. R. R. E. Brockman, R.E., Messrs. A. E. Guest, H. G. Kunhardt, Lieut. R.E., A. C. Lucas, and Lieut.-Col. Newmarch, R.E., as associates. At the meeting a paper was read by Mr. W. Carson, "On the Passenger Steamers of the Thames, Mersey, and Clyde" (a report of which will be found in another column).

QUEKETT MICROSCOPICAL.

Oct. 24th.—Dr. T. S. Cobbold, President, in the chair. Two new members were elected. A paper was read by Mr. A. Martinelli "On the Germination of a Seed." A discussion ensued, in which the President, Dr. Fischer, and Mr. J. T. Powell took part.

Nov. 28th.—Dr. T. S. Cobbold, President, in the chair. Seven new members were elected. A short paper, "On a Method of Dry Mounting," by Prof. H. Smith, was read by the secretary. A paper by the President, "On the Fertilisation of certain Flowering Plants," was read, and gave rise to a discussion.

ROYAL INSTITUTION.

Dec. 1st.—The Duke of Northumberland, President, in the chair. Miss H. M. Adair, Major E. S. Gordon, Messrs. E. G. Amphlett, H. Fearnside, and T. H. Sanderson, were elected members.

SOCIETY OF ENGINEERS.

Dec. 1st.—Mr. R. P. Spice, President, in the chair. A paper was read by Mr. H. Robinson "On Sewage Disposal."

SOCIETY OF BIBLICAL ARCHÆOLOGY.

Dec. 2nd.—Dr. S. Birch, President, in the chair. The Rev. A. Lowy read a communication in two parts: I. "On the Samaritans in Talmudical Writings;" and II. "An Account given by a Samaritan, in A.D. 1713, on the Ancient Copy of the Pentateuch at Nablus."

ARCHÆOLOGICAL INSTITUTE.

Dec. 4th.—The Rev. J. F. Russell in the chair. Mr. R. S. Ferguson sent a paper on the supposed sword of Sir Hugh de Morville, in the possession of Sir Wilfrid Lawson at Brayton Hall, Cumberland. The author showed that the story of the sword with which Sir Hugh de Morville kept guard in the transept of Canterbury Cathedral during the murder of Thomas à Becket, on December 29th, 1170 (o.s.), was connected with a gross error in the early history of Cumberland, originated in the "Chronicon Cambriæ," and amplified in Denton's MS. "History of Cumberland," written in the time of Elizabeth. Mr. H. Hinde has proved that there were several Hughs in the Morville family, and that the Hugh lord of the barony of Burgh was not the Hugh of Canterbury notoriety, for this latter Hugh was lord of Westmoreland and Knaresborough. Denton says that "the sword that killed Thomas à Becket was at Ishall in my father's time, and since remaineth with the house of Arundel." But Denton libelled the sword as the "Chronicon" libelled its owner. The story seems to have its origin in a great sword sculptured on a monumental slab in Aikton Churchyard, Cumberland, said to be the tomb of Sir Hugh de Morville. One after another historians and handbook makers have added to or further mystified the matter. But it was reserved for one Thomas Carlile, a carver of Carlisle, to make a statue as large as life of Sir Hugh de Morville for the late Sir Wilfrid Lawson in 1801. This he set up at Brayton House, and in the hand of the figure he placed "the very sword" with which the knight "assisted in delivering the country from Thomas à Becket." After this statement by Carlile's biographer, the meeting was not surprised to see a basket-hilted Scotch broadsword, probably as late as 1745, bearing on each side of the blade the following distich, "Gott bewahre die auf recte Schotten," which had been sent for exhibition by Sir Wilfrid Lawson. This sword was probably obtained by Carlile from Carlisle Cathedral, where some of the Highlanders were imprisoned in 1745. A sword which was long said to be the very sword of Sir Hugh de Morville has now vanished from the cathedral. Mr. J. D. Grant sent a collection of vessels of pottery from burying places in the Tinnevelli district of the Madras Presidency, and some notes upon them. The unsystematic manner in which these interments were made was remarkable, but the most usual plan appears to have been to pack the bones, which must have been previously denuded of flesh and integuments, in earthen jars, about 3 ft. 6 in. high, and bury them just below the surface. No stone implements were found buried, but some of the jars contained smaller vessels, such as those exhibited. Mr. G. T. Clark sent some observations on Tonbridge Castle, *à propos* of the proposal to convert its area into building sites. The Rev. J. M. Gatrill read a paper on a recent discovery at Greenhithe, and exhibited a human skull and pieces of pottery that had been found. Mr. W. J. Bernhard Smith exhibited a string of beads and bugles of rock crystal, onyx, carnelian, lapis lazuli, &c., and some copper coins, early thirteenth century, all found in the bed of a water-course in Oude. The resemblance of the beads to Anglo-Saxon examples was remarkable. Mr. H. Vaughan sent some fine German and French keys for exhibition, and an Italian miniature of Peter Martyr, early sixteenth century. Mr. R. S. Ferguson sent a ring dial, or *viatorium*, found in a bog in Dumfriesshire. The chairman exhibited some examples of stained glass, sixteenth century.

FOLK-LORE SOCIETY.

Dec. 9th.—Mr. W. R. S. Ralston in the chair. Mr. Coote read a paper "On Catskin—the English and Irish Peau d'Ane." The readers of "The Vicar of Wakefield" are familiar with Goldsmith's reference therein to a folk-tale which he calls "The Adventures of Catskin." This tale, which has been long lost, Mr. Coote reproduced to the English public, and identified with *peau d'âne* and an analogous story which is spread through Europe, Russia and Albania included. Its origin was traced to a myth in the Rig-Veda. In the discussion which followed, Mr. Ralston, though not agreeing with Mr. Coote's theory as to the origin of the story, pointed out that the author had discovered the English and Irish version which Dr. R. Kohler had set the whole staff of the British Museum to work upon, but without success. Mr. D. Nutt and the Rev. J. Long also took part in the discussion.

THE SUPPOSED ARTIFICIAL PRODUCTION OF THE DIAMOND.

On this interesting subject, which is once again engaging public attention, the following communication in the *Times*, by Mr. Nevil Story Maskelyne, of the Mineral Department of the British Museum, is worthy of careful consideration:—

I should be obliged if you would accord me space in the *Times* in order that I may answer a great number of letters and applications which have pursued me during the past few days on a subject of some little public interest, that subject being the asserted formation of diamonds by a gentleman at Glasgow.

Some ten years ago I had heard nothing whatever of the claim of Mr. Mactear, of the St. Rollox Works, Glasgow, to the artificial production of the diamond. My name, however, was already in several newspapers as that of a person in whose hands the asserted diamonds had been placed for a decision as to their true nature. Ultimately, a small watch-glass, with a few microscopic crystalline particles, came into my hands for this purpose from Mr. Warington Smyth, and subsequently a supply came to me direct from Mr. Mactear. I shall proceed to state the results I have obtained from the examination of these.

Out of the first supply I selected by far the largest particle, one about 1-50th of an inch in length, and it may be that I wasted some time in experimenting on this particle as it might not have been an authentic example of the "manufactured diamond," since it differed in some respects from the specimens I have since received from Mr. Mactear.

Now, firstly, the diamond excels all substances in hardness. Secondly, its crystals belong to the cubic system, and should not, therefore, present the property of doubly refracting light. Frequently, however, from the influence of strain within the crystal, caused by enclosed gas-bubbles or other causes, diamonds are not entirely without action on a ray of polarised light sent through them. Finally, the diamond is pure carbon, and, as such, burns away when heated to a sufficiently high temperature in the air, and more vividly so burns or glows away when heated in oxygen gas.

The specimens I had to experiment upon were too light to possess appreciable weight, too small to see unless by very good eyesight or with a lens, yet were, nevertheless, sufficiently large to answer the three questions suggested by the above properties.

A few grains of the dust, for such the substance must be termed, was placed between a plate of topaz—a cleavage face, with its fine natural polish—and a polished surface of sapphire, and the two surfaces were carefully "worked" over each other, with a view to the production of lines of abrasion from the particles between them. There was no abrasion. Ultimately the particles became bruised into a powder, but without scratching even the topaz. They are not diamond.

Secondly, some particles, more crystalline in appearance than the rest, were mounted on a glass microscope slide, and examined in the microscope with polarised light. They acted each and all powerfully in the manner of a birefringent crystal. It seemed even in one or two of them that when they lay on their broadest surface (it can scarcely be called a "crystal face") a principal section of the section of the crystal was just slightly inclined to a flattish side of it in a manner that suggested its not being a crystal of either of the orthosymmetrical systems. Be that as it may, it is not a diamond.

Finally, I took two of these microscopic particles and exposed them to the intense heat of a table blowpipe on a bit of platinum foil. They resisted this attempt to burn them. Then, for comparison, they were placed in contact with two little particles of diamond-dust exceeding them in size, and the experiment was repeated. The result was that the diamond particles glowed and disappeared, while the little particles from Glasgow were as obstinate and unacted on as before. I had previously treated the specimen I have alluded to as the first on which I experimented by making a similar attempt in a hard-glass tube in a stream of oxygen, and the result was the same. Hence I conclude that the substance supposed to be artificially formed diamond is not diamond and is not carbon; and I feel as confident in the results thus obtained from a few infinitesimal particles that can hardly be measured, and could only be weighed by an assay balance of the most refined delicacy, as if the experiments had been performed on crystals of appreciable size.

Not content with merely proving what these crystalline particles are not, I made an experiment to determine something about what they are.

Heated on platinum foil several times with ammonium fluoride they became visibly more minute, and a slight reddish-white incrustation was seen on the foil. At the suggestion of Dr. Flight, assistant in this department, a master in the craft of the chemical analyst, these little particles were left for the night in hydrofluoric acid in a platinum capsule. This morning they have disappeared, having become dissolved in the acid, and on evaporation there is seen a slight white incrustation, on the capsule, of the residuary fluoride. I have, therefore, no hesitation in declaring Mr. Mactear's "diamonds," not only not to be diamonds at all, but to consist of some crystallised silicate, possibly one resembling an augite, though it would be very rash to assert anything beyond the fact that they consist of a compound of silica, possibly of more than one such compound.

The problem of the permutation of carbon, from its ordinary opaque black condition into that in which it occurs in nature as the limpid crystal of diamond, is still unsolved. That it will be solved no scientific mind can doubt, though the conditions necessary may prove to be very difficult to fulfil. It is possible that carbon, like metallic arsenic, passes directly into the condition of vapour from that of a solid, and that the condition for its sublimation in the form of crystals, or its cooling into crystal-diamond from the liquid state, is one involving a combination of high temperature and high pressure present in the depths of the earth's crust, but very difficult to establish in a laboratory experiment.

PASSENGER STEAMERS OF THE THAMES, THE MERSEY, AND THE CLYDE.

By W. Carson, M. Inst. C.E.

The paper on this subject, read at a recent meeting of the Institute of Civil Engineers, is developed by the official abridgment as follows:—It was stated that the bulk of the traffic by light-draught passenger steamers in Great Britain was carried on these rivers, and that each port had adopted a practice independent of the experience of the others. On the Thames above-bridge, small vessels of light drought, moderate speed, great steerage power, and well under engine control, were used, but at the expense of strength of build. On the Thames below-bridge, high speed and large carrying power led to the employment of long vessels. On this river all the lines competed with railway and omnibus routes, necessitating lower fares and inferior passenger accommodation, and therein contrasting unfavourably with the Mersey and the Clyde. At Liverpool, the service was carried on at the mouth of an open estuary, the bulk of the passengers crossing the stream, a distance of less than 2,000 yards, and the vessels were of heavier build, short length in proportion to beam, and great steerage power. On the Clyde the traffic somewhat resembled that of the lower Thames, but the river was more sluggish and there was less competition by land. Under these circumstances the vessels were superior in passenger accommodation, in power, and in the steering arrangements.

Some of the latest examples of the vessels employed in these three river-services were then described, including an above-bridge Thames boat, built of iron by Messrs. Samuda and Co., and a Woolwich boat, built of iron by Messrs. Westwood and Baillie. The chief peculiarity of the ferry boats of the Mersey was that they had the bow and stern alike, with a rudder at each end, one such vessel, the "Claughton," being selected for illustration; also the "Heather bell" and the "Waterlily," different types of vessels used in the more exposed parts of the Mersey. Of the highest class of Clyde passenger steamers, a description was given of the "Lord of the Isles," an iron vessel built in 1877, by Messrs. D. and W. Henderson and Co. The screw passenger boats built by the engineers of the Clyde trustees, and the steamers for the cart and horse traffic, designed by Messrs. W. Simons and Co., were also noticed.

It was next observed that as river craft, engaged within smooth or partially smooth water limits, were not subjected to the strains arising from heavy loads and the rough treatment of sea-going vessels, their proportions and scantlings need not conform to those of the latter, which were designed to carry up to half as much again as their own weight. The severest strains to river craft probably arose from their engine power, from the concentration of heavy machinery in the centres of the vessels, and from the weights of the fine ends which did not provide displacement to carry themselves. The strains, therefore, from load and propelling power, were of so moderate a character that they could be well taken up without such an increase in the total weight as would unfit the vessels for their special work, which particularly demanded speed and a light immersion. In considering their ultimate strength, it was pointed out that, from the long and stormy voyages which many river steamers had performed—work so far beyond that for which they had been designed —their perfect sea-worthiness for their proper duty was beyond question. From collision alone need danger be apprehended, and its results anticipated in their design. The precautions against this latter danger were stated to be: (1) effective division by bulkheads; (2) defence, especially for cross-river traffic, by overhanging sponsons; (3) perfect engine and steerage control. The steering ought to be performed by steam or water power in the larger vessels, with telegraphic communication in every case between the bridge and the engine-room. It was further suggested that an effective bulkhead division ought to be compulsory, and it would not be unreasonable to require that all seats should be fitted loose, and made bouyant, on vessels which carried so great an amount of human life in proportion to their tonnage as to render any adequate provision of boats impossible.

In conclusion, it was remarked that; in the absence of skilful commanders, the precautions of thoughtful construction were useless, and immunity from the most pressing risk—collision—must not be expected from the shipbuilder or the engineer, who could only hope to limit the effects of the injuries caused by such accidents.

LITERARY ANNOUNCEMENTS.

Two gift book stories for the family are announced by Messrs. W. B. Whittingham and Co.; "Jemima, a Tale of English Home Life," by Adelaide; and a re-issue of "Won by Waiting," a tale opening with the siege of Paris, by Edna Lyall.

"The Southern Cross" is the title of a volume of important information on Australia, by Mr. H. Cornish, of Madras; it is announced by Messrs. W. B. Whittingham and Co.

Messrs. W. B. Whittingham and Co. have in the press "Woman's Fortitude," a tale of the Cawnpore mutiny, by Lieut.-Col. Edward Money.

The Rev. Samuel Murch has compiled a handbook for teachers and ministers, entitled "The Teachers' Parables," an Exposition of the Parables of Our Lord. It is included in Messrs. W. B. Whittingham and Co.'s list of new publications.

The ancients regarded the ocean as the cradle of life, and yet they only knew it from the beach; they had no means to sound its depths. Had they, it would have been found that the occupants of the ocean do not inhabit indifferently the depths. Some animals, as can be seen by the reflux of the tide, live about one yard below the mean level of the sea, others at three or six. The same remarks apply to the vegetation. During a neap tide quite new varieties of beings are revealed. Many molluscs that live under the tropics at small depths, extend to the coast of Norway and Newfoundland, in the profoundness of the Atlantic—at the entrance of the Arctic Ocean. In the Lake of Geneva, which is very profound, quite new species of animals have been dredged, some without eyes.

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